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MINERAL INVESTIGATION OF THE VASQUEZ PEAK WILDERNESS STUDY AREA AND ST. LOUIS PEAK AND WILLIAMS FORK ROADLESS AREAS, CLEAR CREEK, GRAND, AND SUMMIT COUNTIES, COLORADO

By Alan M. Bielski, Terry J. Kreidler
and Louis W. Hamm

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This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. Work on this study was conducted by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, Colorado 80225.

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STUDIES RELATED TO WILDERNESS

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of mineral surveys of the Vasquez Peak Wilderness Study Area (A2361), the St. Louis Peak Further Planning Area (E2361) and the Williams Fork Further Planning Area (02114), in the Arapaho National Forest, Clear Creek, Grand, and Summit Counties, Colorado. The roadless areas were classified as further planning areas or proposed wilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979. The Vasquez Peak Wilderness Study Area was established by Public Law 96-560, December 22, 1980.

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By Alan M. Bielski, Terry J. Kreidler, and Louis W. Hamm, Bureau of Mines

INTRODUCTION

The information provided in this report is the result of an investigation by the Bureau of Mines (USBM) that was undertaken, as part of a joint effort with the Geological Survey (USGS), to assess the mineral resources of the Vasquez Peak Wilderness Study Area (WSA), and the St. Louis Peak and Williams Fork Roadless Areas.

Location, size, and geographic setting

The three study areas are located along the Continental Divide and roughly centered around Jones Pass (fig. 1). Jones Pass lies about 65 mi west of Denver and about 2.5 mi west of the Henderson Mine. The Williams Fork and St. Louis Peak Roadless Areas are separated by the Williams Fork River. The Vasquez Peak WSA lies east of the St. Louis Peak Roadless Area and is separated from it by the Fraser Experimental Forest.

The three study areas comprise about 104,400 acres of the Arapho National Forest (St. Louis Peak, 12,800 acres, Williams Fork, 74,820 acres, and Vasquez Peak, 12,800 acres), in the Front Range. The region is typical of the Rocky Mountains, where topography is characterized by high alpine peaks and perennial streams fed by melting snow. Elevations range from 13,553 ft at Pettengill Peak, on the eastern side of the Williams Fork Roadless Area, to 8,700 ft along Acorn Creek, on the western side of the same area. Other prominent peaks include: Byers Peak (12,804 ft) and St. Louis Peak (12,246 ft), in the St. Louis Peak Roadless Area; Hagar Mountain (13,195 ft) and Ptarmigan Peak (12,480 ft), in the Williams Fork Roadless Area; and Vasquez Peak

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Figure 1.--Index map of the Vasquez Peak Wilderness Study Area, and St. Louis Peak and Williams Fork Roadless Areas.

Figure 1.--Index map of the Vaquero Peak Wilderness Study Area, and St. Louis Peak and Williams Fort Roadless Areas.

(12,947 ft) and Stanley Mountain (12,521 ft), in the Vasquez Peak WSA. Much of the land in the three study areas is above timberline.

The study areas are surrounded on three sides by major highways: U.S. 40 on the east; Interstate 70 on the south; and Colorado 9 on the west. Access to the boundaries from the highways is relatively easy along unimproved roads, which run mostly along creek beds. Roads near the boundaries include: F.S. Road 138, along the Williams Fork River; F.S. Road 160, along St. Louis Creek in the Fraser Experimental Forest; F.S. Road 148, along Vasquez Creek. Within the boundaries, travel is by foot or horseback only. Several pack trails, maintained by the Forest Service, are within the study areas.

Present investigation

To evaluate mineral resources that may occur in the study areas, USBM investigated various sources of minerals information. Published literature and USBM files were reviewed; and claimants, prospectors, mine operators, and others having knowledge of mineral occurrences were interviewed to document areas of mineralization and mining activity. Mining claim records were searched at the Summit, Grand, and Clear Creek County Courthouses to provide a historical overview of areas that have been prospected. Claim recordation files at the Bureau of Land Management State Office were searched for current claims. Mines, prospects, and mineralized areas were examined, mapped, and sampled during the field seasons from 1979 to 1982.

USBM personnel took 305 samples from mines, prospects, and mineralized areas in and near the study areas. Samples taken were representative of the mineral occurrences where mineralization was accessible. Dump samples were taken on a grid. Analytical results, reported in the sample tables, are of

metal concentrations that may indicate the occurrence of mineral deposits in the immediate vicinity of the sample locality. All samples were analyzed for gold and silver by fire assay. Selected samples were analyzed for approximately 40 elements by semiquantitative optical emission spectrography. The concentration of copper, lead, molybdenum, and zinc in some samples was determined by atomic absorption analysis. Uranium concentrations, as U_3O_8, were determined by gamma ray spectrometry for samples taken in the Williams Fork Roadless Area and by fluorimetry for Vasquez Peak samples.

Polished sections of vein material from localities in the vicinity of the Williams Fork Roadless Area were examined under an optical microscope to determine ore mineralogy.

Kreidler worked in the Vasquez Peak WSA and Bielski and Hamm investigated the St. Louis Peak and Williams Fork Roadless Areas.

Complete sample analyses from this investigation are available for public inspection at the Bureau of Mines, Intermountain Field Operations Center, Denver Federal Center, Denver, Colorado 80225.

Previous investigations

Lovering and Goddard (1950) made an extensive study of the geology and ore deposits of the Front Range, which includes parts of the study areas. Theobald (1965) mapped the geology of the Berthoud Pass Quadrangle, where the major part of the Vasquez Peak WSA is located. The geology of the eastern part of the St. Louis Peak Roadless Area was mapped by Taylor (1971). The geology of the northern part of the St. Louis Peak Roadless Area and the extreme western part of the Vasquez Peak WSA is included in the Bottle Pass Quadrangle, mapped by Taylor (1975). Warner (1971) made a detailed geologic and engineering study of the Denver Water Board's Vasquez Tunnel. Members of AMAX's exploration and development departments have published several studies

related to molybdenum deposits at Red Mountain and a detailed bibliography on the subject can be found in White and others (1981).

Acknowledgments

The authors thank all claimants and owners of patented mining claims for granting permission to map and sample the mineral occurrences on their properties. In addition, we thank Cecil and George Riggle, the holders of the La Plata claim group, for providing much of the historical background and the locations of many of the "not so obvious" mine workings in the La Plata and Dailey mining districts. Several of the staff at AMAX provided much geologic data on the Vasquez Peak WSA; in particular we thank Willis White, Arne Ward, Art Bookstrom, and Bob Kamilli for their help.

Mining activity

The three study areas lie along the northwest margin of the Colorado Mineral Belt as defined by Lovering and Goddard (1950).

Vasquez Peak Wilderness Study Area

In October 1982, there was no active mining within the WSA; however, approximately 1 mi south of the boundary, AMAX was mining the Henderson molybdenum deposit at Red Mountain (pl. 1).

Several large blocks of claims are located along the northeast and southeast boundaries (pl. 1). Amoco Metals Company conducted an exploration program on their claims along the northeast boundary of the study area in August of 1982. In 1982, AMAX continued exploration on their block of claims near the Puzzler Mine on the southeastern boundary.

The major mining activity in the vicinity of the study area has centered around Red Mountain, about 1 mi south of the WSA, where molybdenum minerals were discovered at the turn of the century. The Urad Mine, on the southern slope of Red Mountain, was worked periodically from 1914 to 1974 and produced

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The major mining activity in the vicinity of the study area has centered around Red Mountain, about 1 mi south of the WSA, where molybdenum minerals were discovered at the turn of the century. The Urad Mine, on the southern slope of Red Mountain, was worked periodically from 1914 to 1974 and produced

14 million tons of ore averaging 0.348 percent MoS_2. At the Henderson Mine, which began production in 1976, is a separate but related ore body below the northern slope of Red Mountain. Henderson's maximum output is rated at 30,000 tons of molybdenum ore per day. Ore is hauled by rail to the mill, which is just north of the Williams Fork Roadless Area in sec. 25, T. 2 S., R. 78 W. Together, these two deposits contain the second largest known concentration of molybdenum minerals in the world (Wallace and others, 1978, p. 325-326).

St. Louis Peak Roadless Area

In 1982, no mining activity was being conducted within the St. Louis Peak Roadless Area. Past activity within the roadless area was limited to surficial exploration, as evidenced by a few, small prospect pits. Less than 1 mi east of the roadless area, near St. Louis Lake and near Iron Creek in the Frazer Experimental Forest, silver and base-metal occurrences were prospected by short adits during the early 1900's. These workings were not active in 1982. Mining activity near the southwestern corner of the St. Louis Peak Roadless Area is discussed in the Williams Fork and Vasquez Peak sections of this report.

Williams Fork Roadless Area

Mining activity has occurred mostly within or near the northeast boundary of the Williams Fork Roadless Area in the vicinity of Jones Pass (pl. 1). Mineral occurrences near Jones Pass contain lead, molybdenum, silver, uranium, zinc, and other metals.

In 1981, the lead-zinc-silver mines near Jones Pass were idle, except for annual assessment work on mining claims and maintenance to some of the mines. The La Plata Mine, inside the roadless area, was leased early in 1982;

but, as Jones Pass remained snowbound throughout most of the summer, the inaccessibility of the property prevented scheduled exploration work by the operator.

The lead, zinc, and silver veins have been prospected and mined in the Jones Pass area since 1866. Unpublished USBM records indicate that, for the years 1914-43, intermittent production from mines just west of Jones Pass totaled (gross metal content): 6,074 oz silver, 1 oz gold, 6,609 lbs lead, and 658 lbs zinc. For many of the developed deposits in the area, no production was recorded; thus, the actual amount of ore produced was greater than that indicated by the above figures.

The only evidence of mining activity that is not in the vicinity of Jones Pass is a small trench, 1.5 mi north of Dillon at the southern tip of the Williams Fork Roadless Area. No potentially valuable minerals were observed in the trench, nor did samples from this locality contain significant concentrations of metals.

MINING DISTRICTS AND MINERALIZED AREAS

Mining districts

Two organized mining districts are in or near the study areas, the La Plata and the Dailey (Atlantic), separated by Jones Pass and the Continental Divide. East of the St. Louis Peak Roadless Area are two unorganized districts, Byers Peak (St. Louis Lake) and Iron Creek.

La Plata mining district

The northeastern part of the Williams Fork Roadless Area and the southeastern corner of the St. Louis Peak Roadless Area are in the La Plata mining district. Evidence of mining activity within the district extends westward from the Continental Divide and Jones Pass, along Bobtail and Steelman Creeks,

but, as Jones Pass remained accessed throughout most of the summer, the inaccessibility of the property prevented scheduled exploration work by the operator.

The lead, zinc, and silver veins have been prospected and mined in the Jones Pass area since 1880. Unpublished USBM records indicate that, for the years 1914-43, intermittent production from mines just west of Jones Pass totaled (gross metal content): 6,076 oz silver, 1 oz gold, 6,809 lbs lead, and 638 lbs zinc. For many of the developed deposits in the area, no production was recorded; thus, the actual amount of ore produced was greater than that indicated by the above figures.

The only evidence of mining activity that is not in the vicinity of Jones Pass is a small trench, 1.5 mi north of Dillon at the southern tip of the Williams Fork Roadless Area. No potentially valuable minerals were observed in the trench, nor did samples from this locality contain significant concentrations of metals.

MINING DISTRICTS AND MINERALIZED AREAS

Mining districts

Two organized mining districts are in or near the study area, the La Plata and the Dailey (Atlantic), separated by Jones Pass and the Continental Divide. East of the St. Louis Peak Roadless Area are two unorganized districts, Spruce Peak (St. Louis Lake) and Iron Creek.

La Plata mining district

The northeastern part of the Williams Fork Roadless Area and the southeastern corner of the St. Louis Peak Roadless Area are in the La Plata mining district. Evidence of mining activity within the district extends westward from the Continental Divide and Jones Pass, along Bobtail and Treleman Creeks,

to the confluence of Steelman Creek and Williams Fork (pl. 1). Records at the Grand and Summit County Courthouses indicate more than 300 mining claims have been located in the district since 1866. Eighteen of these claims, as well as 12 patented lode claims and 2 patented placer claims, have been recorded at the Bureau of Land Management State Office.

Dailey (Atlantic) mining district

The Dailey (Atlantic) mining district extends eastward toward Empire, Colo., from the Continental Divide and Jones Pass, along West Fork Clear Creek (Dailey Gulch) and Butler Gulch. The southern part of the Vasquez Peak WSA is within the district. Of the many claims that have been located in the Dailey district, approximately 200 claims were on file at the Bureau of Land Management State Office, and five had been patented.

Byers Peak (St. Louis Lake) and Iron Creek districts

Just east of the St. Louis Peak Roadless Area are the unorganized Byers Peak (St. Louis Lake) and Iron Creek mining districts. Approximately 25 claims have been located in the districts since 1908; those that could be plotted are shown on plate 1. The mining districts are within the Fraser Experimental Forest which was withdrawn from mineral entry in 1955.

Mineralized areas

In the vicinity of the study areas, most lead-zinc-silver occurrences are localized in an east-west trending, elongate zone that is roughly centered around Red Mountain. The zone includes parts of the Vasquez Peak Wilderness Study Area and the St. Louis Peak and Williams Fork Roadless Areas. The Henderson molybdenum deposit is related to a Tertiary rhyolite porphyry intrusion and is restricted to Red Mountain; however, a lead-zinc halo extends to the north from the Henderson ore body into parts of the study

areas. The mineralization in the mines and prospects on the southern slopes of Stanley and Vasquez Mountains is within and probably related to the lead-zinc halo of the Henderson deposit (Art Bookstrom, AMAX, oral commun., 1982). Lead-zinc-silver occurrences west of Jones Pass may also be related to the Henderson deposit, but evidence for this is somewhat circumstantial. At the St. Louis Mine, near the St. Louis Peak Roadless Area, the lead-zinc-silver occurrences are dissimilar to those near Red Mountain and have no apparent relationship to the Henderson deposit. The mines and prospects of the Vasquez Peak Wilderness Study Area and the St. Louis Peak and Williams Fork Roadless Areas are summarized in tables 1-3 respectively.

Vasquez Peak Wilderness Study Area

The WSA, which is north of the Henderson Mine, is mostly underlain by Precambrian Silver Plume Granite that contains local blocks of gneiss of the Idaho Springs Formation. The granite is extensively broken by faults and wide (as much as 1,500 ft) shear zones having a predominantly northeast trend, offering abundant conduits for mineralizing fluids. Although several of these structures have been mineralized on the southern slopes of Vasquez and Stanley Mountains, no mineralization of similar faults and shear zones was observed on the surface within the WSA boundary. However, the possibility of mineralization at depth or near surface mineralization beneath the extensive glacial debris can not be precluded.

Lead-zinc-silver occurrences along the West Fork Clear Creek

Doctor and Scott Mines.--The Doctor and Scott Mines are located approximately 1 mi south of the roadless area (pl. 1). They were inaccessible in 1982 and the brief summaries in table 1 are based on work by Lovering and Goddard (1950, p. 281-282).

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The WSA, which is north of the Henderson Mine, is mostly underlain by Precambrian Silver Plume Granite that contains local blocks of gneiss of the Idaho Springs Formation. The granite is extensively broken by faults and veins (in much as 3,500 ft) whose zones having a predominantly northeast trend, offering abundant conduits for mineralizing fluids. Although several of these structures have been mineralized on the southern slopes of Vasquez and Stanley Mountains, no mineralization of similar kinds and zones was observed on the surface within the WSA boundary. However, the possibility of mineralization at depth or near surface mineralization beneath the extensive glacial debris can not be precluded.

Lead-zinc-silver occurrences along the West Fork Clear Creek

Doctor and Scott Mines.--The Doctor and Scott Mines are located approximately 1 mi south of the roadless area (pl. 1). They were inaccessible in 1982 and the brief summaries in table 1 are based on work by Loevling and Goddard (1950, p. 381-382).

A sample taken on the Scott dump contained a minor amount of lead (table 4, sample 165). Three dump samples, two from separate lobes of the lower level, one from the upper level, of the Doctor Mine contain an average 0.49 percent lead and 0.35 percent zinc. The two samples from the lower dump contained 0.8 and 1.0 oz silver per ton (table 4, samples 169-170). As much as 15 percent zinc and 10 oz silver per ton were reported in Doctor Mine ores (Lovering and Goddard, 1950, p. 282).

The veins in the Doctor and Scott Mines essentially parallel the southwestern boundary of the study area and it does not seem likely that the veins extend into the WSA; however, they may extend into the St. Louis Peak Roadless Area. Ground cover prevented surface tracing of the veins and this extension is speculative.

Puzzler Mine.--The Puzzler Mine (table 1, fig. 2) is located along the Henderson Mine road about 1/2 mi west of U.S. 40 and approximately 4,000 ft south of the WSA boundary (pl. 1). The vein consists almost entirely of quartz and abundant disseminated pyrite and ranges in width from 0 to 3 ft; the trend varies from N. 60° E. to N. 85° E., and the vein dips steeply from northwest to southeast. Argillic, sericitic and silicic alteration are so pervasive throughout the wall rock that identification of rock type is locally difficult. The ribs are locally covered with several inches of clayey jarosite and needle-like crystals of gypsum.

Assay results from the Puzzler Mine's two levels (table 5) indicate minor silver enrichment; values on the upper level range from 0.2 to 3.3 oz silver per ton, but silver values, 65 ft below on the lower level, were consistently lower, implying decreasing mineralization with depth. No other metal concentrations were noted.

Although the vein could not be traced far on the surface, it is possible, according to Theobald (1965), that the fault containing the vein extends for several miles along the southeastern and eastern boundaries of the study area.

Scotia Mine.--The Scotia Mine (table 1, fig. 3) is about 1,000 ft east of, and 200 ft lower than the Puzzler Mine, and less than 1 mi south of the roadless area boundary. The host rock is Silver Plume Granite, locally altered, but not as extensively as in the Puzzler Mine. Vein material consists of quartz, with varying amounts of pyrite occurring as disseminated blebs and veinlets. The vein pinches and swells from 0 to 3 ft.

Analytical data (table 6) from the adit indicate the vein does not contain any metal concentrations.

Although the vein trends toward the WSA, it cannot be traced on the surface; it would most likely intersect, and be cut off by, the Puzzler vein and therefore probably does not extend into the study area.

Little Alice Mine.--The Little Alice Mine (table 1, fig. 4) is located about 1/4 mi north of U.S. 40 and about 1 mi southeast of the WSA boundary (pl. 1). The adit was driven to intersect at depth the vein exposed in a now caved surface working, about 100 ft above the adit; however, the vein was never found, probably displaced by faulting (Cecil Riggle, former claim owner, oral commun., 1982). A select sample from the dump of the caved working assayed 12.4 oz silver per ton (fig. 4). The vein trends northwest, toward the study area, but can be traced on the surface only a short distance.

Other occurrences.--The numerous prospect pits and caved adits scattered along the slope from the southern WSA boundary to the Henderson Mine road (pl. 1) are on small quartz veins in fractures and faults in Silver Plume Granite or along the contact between the granite and gneiss of the Idaho

Springs Formation. The veins usually contain abundant pyrite. Some of the prospect pits are lcoated on zones of alteration in the granite with no evidence of quartz or other forms of mineralization visible. Examples of the latter are the three small prospect pits in Vasquez Pass, two of which fall just inside the WSA boundary. These were located in granite in an alteration zone probably related to the Vasquez Pass shear zone. Assay data indicate no metal concentrations. Assays of the remaining samples, however, indicate that lead, zinc, and silver occur sporadically throughout the area affected by the Henderson lead-zinc halo. The trends of the veins could not be determined due to slope cover, therefore, it is not known if any veins extend into the study area.

Uranium occurrences near First Creek

The Silver Plume Granite, which underlie most of the study area, is abnormally radioactive. The radioactivity is due primarily to thorium, although the Silver Plume, in the vicinity of Idaho Springs, Colo., is known to contain an average of 0.006 percent equivalent uranium, as determined by radioactivity measurements (Sims, 1963, p. 12-13). In the study area, an outcrop sample of Silver Plume contained 0.004 percent U_3O_8 (table 4, sample 303), a concentration approximately 10 times higher that the average granite (Levinson, 1974, p. 44) and a significant anomaly in hard rock uranium exploration. Amoco Metals Company in Denver, Colo., holds a block of claims astride the eastern boundary of the study area which includes the above sample locality. The claims are underlain by extensively faulted and sheared Silver Plume Granite. Exploration work by Amoco on these claims during the 1982 field season produced very positive results which will lead to further exploration for vein-type uranium deposits within the WSA in 1983 (John Squires, Amoco Metals Company, oral commun., 1982).

St. Louis Peak Roadless Area

Within the St. Louis Peak Roadless Area, four small prospect pits, along fracture or fault zones in gneiss, were found by the USGS during the course of geologic mapping. Samples from the pits contained geochemically anomalous amounts of copper (P. Theobald, USGS, written commun., 1980). Veins in the Doctor and Scott Mines, discussed under the Vasquez Peak WSA heading of this section, may extend into the southeastern part of the St. Louis Peak Roadless Area, but ground cover prevented tracing the veins into the roadless area.

Lead-zinc-silver occurrences in the St. Louis mine area

One adit and five small prospect pits at the St. Louis Mine (fig. 5) are approximately 1/2 mi east of the roadless area, in the SW1/4 sec. 31, T. 2 S., R. 76 W. (unsurveyed). Another adit, reported by Taylor (1971), was not located during this investigation. The Mt. Vasquez Mines Company, J. D. Milliken, President, operated here during the 1920's and 1930's. A mineral patent application, filed on two claims in 1965, was denied in 1967 as land within the Fraser Experimental Forest had been withdrawn from mineral entry since 1955. Below a surficial oxidized zone, lead, zinc, and silver sulfides are concentrated in a localized marble bed that contains quartz and diopside (Lovering and Goddard, 1950, p. 65, 70-71; Taylor, 1971). The origin of the deposit at the St. Louis Mine is uncertain, however, on the basis of the age determined for similar sulfide deposits in the Front Range (Sheridan and Raymond, 1977, p. 5-6), the mineralization would be at least as old as the Precambrian metamorphism.

At the face of the St. Louis Mine adit, pyrite, galena, sphalerite, and possibly magnetite occur in quartz, diopside, and calcite gangue. A 3.0-ft chip sample across the face assayed 1.8 oz silver per ton, 6.3 percent zinc,

and 3.5 percent lead. Four other chip samples taken within the adit contained lesser to negligible concentrations of these metals (fig. 5).

Two of several other samples taken in the St. Louis mine area, assayed high in silver, lead, zinc, and copper (table 7, samples 6 and 13).

Rocks similar to those which host the lead-zinc-silver occurrence in the St. Louis mine area are present locally within the St. Louis Peak Roadless Area, but are not known to contain significant metal concentrations.

Silver occurrence at the Iron Creek Mine

The Iron Creek Mine (fig. 6), on the southern bank of Iron Creek, is approximately 1 1/4 mi southeast of the St. Louis Peak Roadless Area. Unstable rock conditions in the adit prevented detailed mapping and sampling. A cursory examination showed that the adit extends about 110 ft westward into hornblende gneiss which contains scattered pegmatite veinlets of quartz, potassium feldspar, and disseminated pyrite. A 3.0-ft sample from across the back at the portal assayed 0.5 oz silver per ton. The veinlets may be the result of either Precambrian metamorphic or igneous processes that occurred in the area; however, an igneous source for the veinlets has not been identified.

Assays of samples taken of float below limonite-stained outcrops north of the lower lake at the head of Iron Creek, contained no metal concentrations other than 0.1 percent antimony in one sample (table 7).

Williams Fork Roadless Area

In and near the northeast part of the Williams Fork Roadless Area, known mineral occurrences are clustered about Jones Pass on the Continental Divide, where silver, lead, and zinc have been mined and uranium has been prospected.

Claims in and near the roadless area that could be plotted are shown on plate 1. Most of these claims are located in the La Plata and Dailey (Atlantic) mining districts, except for placer claims in the northwestern part of the roadless area, and a lode claim 2.5 mi north of Dillon.

Lead-zinc-silver occurrences near Jones Pass

Epithermal quartz veins, with lead, zinc, and silver minerals, have been mined and prospected near Jones Pass in an area that includes the northeast part of the Williams Fork Roadless Area (figs. 7 to 15; tables 8 to 13). Major workings, some of which are inside and some outside of the study area boundary, are summarized in table 3. The geologic characteristics of all the occurrences are very similar and are summarized in the following discussion.

Workings range in size from small prospect pits, which are a few feet in depth and expose minor mineral occurrences, to mine groups, which extend more than 2,000 ft on major vein systems and may still contain ore. Measured widths of veins range from 0.1 to 5.0 ft. Veins are poorly exposed and cannot be traced any great distance because most of the surface area is covered by scree, glacial debris and vegetation. Limited exposure and accessibility preclude the determination of the overall size and grade of individual mineral occurrences and provides for the possibility that similar occurrences may remain undetected near Jones Pass.

Maximum lead-zinc-silver concentrations detected in samples from the veins are 29.0 oz silver per ton, 1.82 percent lead, and 4.10 percent zinc. Concentrations of arsenic, barium, cadmium, cobalt, copper, gold, lanthanum, lithium, manganese, molybdenum, nickel, and vanadium were found in some samples. These metals commonly occur in both the veins and the country rock in this part of the Front Range.

Claims in and near the roadless area that could be plotted are shown on plate 1. Most of these claims are located in the La Plata and Dolly (Ellsworth) mining districts, except for placer claims in the northwestern part of the roadless area, and a few claims in the northeastern part of the roadless area, and a few claims in the vicinity of Dillon.

Lead-zinc-silver occurrences near Jones Pass

Epithermal quartz veins, with lead, zinc, and silver minerals, have been mined and prospected near Jones Pass in an area that includes the northeast part of the Williams Fork Roadless Area (figs. 7 to 13; tables 2 to 13). Major workings, some of which are inside and some outside of the study area boundary, are summarized in table 3. The geologic characteristics of all the occurrences are very similar and are summarized in the following discussion.

Workings range in size from small prospect pits, which are a few feet in depth and expose minor mineral occurrences, to mine groups, which extend more than 2,000 ft on major vein systems and may still contain ore. Measured widths of veins range from 0.1 to 3.0 ft. Veins are poorly exposed and cannot be traced any great distance because most of the surface area is covered by scree, glacial debris and vegetation. Limited exposure and accessibility preclude the determination of the overall size and grade of individual mineral occurrences and provides for the possibility that similar occurrences may remain undetected near Jones Pass.

Maximum lead-zinc-silver concentrations detected in samples from the veins are 13.0 oz silver per ton, 1.8% percent lead, and 9.10 percent zinc. Concentrations of arsenic, barium, cadmium, cobalt, copper, gold, lanthanum, lithium, manganese, molybdenum, nickel, and vanadium were found in some samples. These metals commonly occur in both the veins and the country rock in this part of the Front Range.

The most commonly identified ore minerals in the veins are galena and sphalerite, with very minor amounts of chalcopyrite. Silver is in intimate chemical and (or) mineralogical association with these minerals. Tetrahedrite, argentite, and cerussite are present in the vein material at the La Plata Mine (fig. 11).

The lead-zinc-silver minerals are most commonly in a quartz and pyrite gangue. Fluorite and marcasite were noted at the Hagar Mine (table 8, samples 40-42).

Country rock is Precambrian Silver Plume Granite and includes local unzoned pegmatites and xenoliths of older Precambrian metamorphic rocks. The granite usually is fractured and hydrothermally altered along the margins of faults and veins.

The primary sulfide minerals are within epithermal veins that were deposited along faults in the Precambrian country rock. The faults served as conduits for mineralizing fluids that may have ascended from a large, middle Tertiary igneous complex intruded below the region. The brecciated character of ore minerals indicates that faulting continued after the emplacement of vein material.

The intensity of mineralization is extremely variable along the course of the veins and high metal concentrations generally are localized in discontinuous zones. Some very high grade zones occur at vein intersections, and near the surface, where weathering processes have enriched the vein in metals.

Lead-zinc-silver resources are possible at any of the mine workings that occur within the Williams Fork Roadless Area. Samples taken along drifts between inaccessible stopes, and from vein material from the surface above caved workings, indicate the presence of lead-zinc-silver resources; however, the amount of the resources remaining after mining was not determined because the underground workings were not fully accessible.

The most common identified ore minerals in the veins are galena and sphalerite, with very minor amounts of chalcopyrite. Silver is in intimate chemical and (or) mineralogical association with these minerals. Tetrahedrite, argentite, and cerussite are present in the vein material at the La Plata Mine (fig. 11).

The lead-zinc-silver minerals are most commonly in a quartz and pyrite gangue. Fluorite and muscovite were noted at the Eagle Mine (table 5, samples 40-42).

Country rock is Precambrian Silver Plume Granite and includes local unnamed pegmatites and xenoliths of older Precambrian metasedimentary rocks. The granite usually is fractured and hydrothermally altered along the margins of faults and veins.

The primary sulfide minerals are within epithermal veins that were deposited along faults in the Precambrian country rock. The faults served as conduits for mineralizing fluids that may have extended from a large, middle Tertiary igneous complex intruded below the region. The brecciated character of ore minerals indicates that faulting continued after the emplacement of vein material.

The intensity of mineralization is extremely variable along the course of the veins and high metal concentrations generally are localized in discontinuous zones. Some very high grade zones occur at vein intersections, and near the surface, where secondary processes have enriched the vein in metals.

Lead-zinc-silver resources are possible at any of the mine workings that occur within the Williams Fork Mountains area. Samples taken along drifts between inaccessible stopes, and from vein material from the surface above caved workings, indicate the presence of lead-zinc-silver resources; however, the amount of the resources remaining after mining was not determined because the underground workings were not fully accessible.

Uranium occurrence near Jones Pass

Uranium occurs at the Ray claims, 1/2 mi southwest of Jones Pass and 1/4 mi outside the roadless area. A fault, trending N. 80° E. and dipping 50° NW, roughly parallels the roadless area boundary and is exposed in a prospect pit. The fault cuts altered Silver Plume Granite and contains the uranium minerals autunite and uranophane (U.S. Atomic Energy Commission, 1966, Preliminary reconnaissance reports, Grand County, Colorado: Released from Grand Junction office, Grand Junction, Colorado.) Two samples taken across the fault assayed 0.04 and 0.007 percent U_3O_8 (table 8, samples 94 and 95).

SUMMARY

Vasquez Peak Wilderness Study Area

Except for two small, barren prospect pits in Vasquez Pass, no known workings are within the boundary; therefore this investigation of the Vasquez Peak Wilderness Study Area consisted of a reconnaissance of the study area and mapping and sampling within 1 mi of the boundary.

Undiscovered small fissure-vein deposits of lead, zinc, and silver may occur in the southern part of the study area. This conclusion is based on: 1) the occurrence of structures within the study area similar to those which have been mineralized just south of the WSA from the Continental Divide (WSA boundary) to the Henderson Mine road, and 2) the presence of the lead-zinc alteration halo from the Henderson ore body.

The northeast part of the study area is currently being explored for the occurrence of vein-type uranium deposits. A uranium resource may exist in the WSA, this conclusion is based on: 1) the known high average uranium content of the Silver Plume Granite, 2) the abundance of structures along which uranium concentration can occur, and 3) the positive exploration results recently reported by Amoco Metals Company.

St. Louis Peak Roadless Area

Samples taken by the USGS from small prospect pits along fault and fracture zones contained copper in concentrations that were too low to constitute resources. Marble and associated calcium-silicate rocks, which host the lead-zinc-silver occurrences in the adjacent St. Louis mine area, occur locally within the roadless area but are not known to be significantly mineralized. Pegmatite veinlets, such as those that are silver-bearing at the Iron Creek adit, are very common in the metamorphic rocks of the region but are not known to be mineralized in the roadless area. Veins in the Doctor and Scott Mines may extend into the southeastern corner of the St. Louis Peak Roadless Area.

Williams Fork Roadless Area

Lead, zinc, and silver resources may occur in veins within the northeastern part of the Williams Fork Roadless Area near Jones Pass. Because of limited exposure and accessibility, determination of the size and grade of individual occurrences was impossible.

Low concentrations of uranium and molybdenum were detected in samples of veins from the Jones Pass area, but not in sufficient quantities to indicate the immediate presence of resources.

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Table 1.--Mines and prospects of the Vasquez Peak Wilderness Study Area

[Sample numbers correspond to locality on map]

Sample nos.	Prospect name and location	Occurrence	Geology	Development and production
164-165	Scott Mine NW1/4 sec. 23, T. 3 S., R. 76 W., (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite, vein trends northwest; ore minerals are sphalerite and galena with minor pyrite; gangue minerals are quartz and rhodochrosite.	1,100 ft adit, caved; no production records (Lovering and Goddard, 1950).
169-174	Doctor Mine NE1/4 sec. 23, T. 3 S., R. 76 W., (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite and Idaho Springs Fm., vein trends northwest, dips east; ore minerals are sphalerite, galena, minor chalcopyrite, and pyrite; gangue is quartz.	Short upper adit, caved, and 1,100 ft lower adit, caved; no production records (Lovering and Goddard, 1950).
186-263	Puzzler Mine SE1/4 sec. 19, T. 3 S., R. 75 W. (unsurveyed).	Ag	Fissure vein trending northeast, in Silver Plume Granite and Idaho Springs Fm.; vein consists of quartz with abundant pyrite, width ranges from 0 to 3 ft, argillic, sericitic and silicic alteration pervasive.	100-ft deep discovery shaft; 192 ft upper level, extensively stoped; 1,200 ft lower level, 65 ft below upper level; no production records (Lovering and Goddard, 1950).
265-275	Scotia Mine SE1/4 sec. 19, T. 3 S., R. 75 W. (unsurveyed).	Ag?	Fissure vein, trending northeast, in Silver Plume Granite; vein consists of quartz with sparse to abundant pyrite, vein width varies 0-3 ft, local argillic, sericitic and silicic alteration.	200 ft adit; no production records (Lovering and Goddard, 1950).

Table 1.--Mines and prospects of the Vasquez Peak Wilderness Study Area--Continued

Sample nos.	Prospect name and location	Occurrence	Geology	Development and production
296-301	Little Alice Mine NE1/4 sec. 20, T. 3 S., R. 75 W. (unsurveyed).	Ag	Fissure vein in Silver Plume Granite and Idaho Springs Fm.; vein is quartz with pyrite.	Caved upper adit of unknown length; several prospect pits; 470 ft lower adit, driven north, failed to intersect vein, which was apparently faulted out of place (Cecil Riggle, claim owner, personal communication).
302-303	Berthoud claims sec. 32-34, T. 2 S., R. 75 W., and sec. 3-5, 8-9, T. 3 S., R. 75 W. (unsurveyed).	U	Fractured and faulted Silver Plume granite.	Prospect in exploration stages.

Table 2.--Mines and Prospects of the St. Louis Peak Roadless Area

[Sample numbers correspond to locality on map]

Sample nos.	Prospect name and location	Occurrence	Geology	Development and production
3-5	Iron Creek adit, NW 1/4 sec. 25, T. 2 S., R. 77 W., (unsurveyed).	Ag	Pegmatite veinlets in hornblende gneiss.	1 adit; 100 ft
7-11	St. Louis mine (Mt. Vasquez Mine), SW1/4 sec. 31, T. 2 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Disseminated sulfides in marble, quartz, and diopside.	2 adits; 70 ft, other is inaccessible (Lovering and Goddard, 1950; Taylor, 1971).

Table 3.--Mines and prospects of the Williams Fork Roadless Area

[Sample numbers correspond to locality on map]

Sample nos.	Prospect name and location	Occurrence	Geology	Development and production
21-38	Oro Fino Mine, SE1/4 sec. 20, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite; determined from dump samples; no major mineralized structures encountered in open adits.	5 adits; 240 ft, 130 ft, others are inaccessible; 1 prospect pit.
40-42	Hagar Mine, (WIM Tunnels), SE1/4 sec. 29, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite; determined from dump samples.	3 adits; inaccessible; 1,200 ft developed as of 1936 (Mine Managers Reports, Colorado Division of Mines).
43-46	No Name prospect, NW1/4 sec. 29, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Mineralized fault in Silver Plume Granite; fault strikes N. 86° E., dips 75° NW; 2.0-5.0 ft wide.	1 adit; 24 ft.
48-50	Luella Mine, NW1/4 sec. 29, T. 3 S., R. 76 W. (unsurveyed).	Ag	Fissure vein, in Silver Plume Granite; determined from dump samples.	3 adits; inaccessible; 1,400 ft developed as of 1906 (Mine Managers Reports, Colorado Division of Mines).
51-52	Bobtail Mine, SW1/4 sec. 28, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite; determined from dump samples.	1 adit; inaccessible, 500 ft developed, and 10-stamp mill as of 1929; 2 tons ore shipped 1941-1942 (Lovering and Goddard, 1950).
53-54	Silver Moon prospect, SW1/4 sec. 28, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Mineralized fault in Silver Plume Granite; fault strikes N. 5° E., dips 82° NW; 0.3 ft wide.	2 adits; 10 ft, other is inaccessible; 2 prospect pits.

Table 3.--Mines and prospects of the Williams Fork Roadless Area--Continued

Sample nos.	Prospect name and location	Occurrence	Geology	Development and production
55-92	Ready Cash Mine, NE1/4 sec. 28, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Fissure veins in Silver Plume Granite; major vein strikes N. 13° E., dips 71° E.; approximately 5 ft wide; partially accessible.	5 adits; 600 ft, 150 ft, 25 ft, others are inaccessible but are reported to be 800 ft and 900 ft as of 1929; 1 shaft 30± ft; 15 prospect pits and trenches; 33 tons ore shipped 1914-1943 (Lovering and Goddard, 1950; Mine Managers Report-Colorado Division of Mines).
94-95	Ray prospect, NW1/4 sec. 27, T. 3 S., R. 76 W. (unsurveyed).	U		Open cut, 5 ft (U.S. Atomic Energy Commission, 1966).
97-103	Hans Hoffman Mine, SE1/4 sec. 28, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Mineralized fault in Silver Plume Granite; determined from dump samples.	2 adits, inaccessible; 1 shaft, depth unknown; 5 prospect pits and trenches.
105-121	La Plata Mine, SW1/4 sec. 34, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb	Fissure veins in Silver Plume Granite; very poor exposure, but veins trend generally northeast.	4 adits; one is 12 ft, others are inaccessible; but one is reported to be 85 ft long; 1 shaft, 60 ft deep; 10 pits; trenches and open cuts; 5 tons ore shipped 1934 (C. Riggle, oral communication, 1982).
123-131	Butler Mine, NE1/4 sec. 34, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite; determined from dump samples; no major mineralized structures encountered in open adits.	4 adits; 20 ft, 45 ft, others are inaccessible; 8 prospect pits.

Table 3.--Mines and prospects of the Williams Fork Roadless Area--Continued

Sample nos.	Prospect name and location	Occurrence	Geology	Development and production
133-134	Jean Lode, SW1/4 sec. 26, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Mineralized fault in Silver Plume Granite; determined from dump samples.	1 adit; inaccessible, developed 900 ft as of 1920 (Mine Managers Reports, Colorado Division of Mines).
135-144	No Name adit, NW1/4 sec. 26, T. 3 S., R. 76 W. (unsurveyed).	None	Fault in Silver Plume Granite; fault strikes N. 60° E., dip varies; 0.5-2.0 ft wide.	1 adit; 155 ft.
146-149	No Name shaft, NW1/4 sec. 26, T. 3 S., R. 76 W. (unsurveyed).	None	Contact between gneiss and Silver Plume Granite; 3 ft wide pegmatite vein at face.	1 shaft; 70 ft.
151-163	Jeremiah Mine, NW1/4 sec. 23, T. 3 S., R. 76 W. (unsurveyed).	Ag, Pb, Zn	Fissure vein in Silver Plume Granite; vein strikes N. 20° E., dips 60° E.; approximately 0.5 ft wide; vein terminated by fault striking N. 42° W., dipping 74° SW; structures exposed in both adits.	2 adits; 120 ft and 50 ft.

Table 4.--Results of analyses of samples not shown in figures from the Vasquez Peak Wilderness Study Area

[Tr, trace; ---, not detected; >, greater than]

Sample No.	Type/Width	Ag	Au	Pb	Zn	Other	Description
		oz/ton		percent			
164	Grab.....	---	Tr	0.12	2.5		Dump, Scott Mine; chlorite and sericite, heavily iron stained, altered granite.
165	Grab.....	---	---	.17	.03		Do.
166	Chip, 3.0 ft..	---	---	---	---		Prospect pit; quartz-rich zone, west trend, vertical dip; limonite stain, in granite.
167	Grab.....	---	---	---	---		Dump, as above.
168	Grab.....	---	---	---	---		Dump, caved adit; granite with quartz veins.
169	Grab.....	0.8	---	.58	.34		Dump, Doctor Mine; pyrite, galena, sphalerite, heavily iron stained.
170	Grab.....	1.0	0.006	.48	.23		Do.
171	Grab.....	.2	---	.41	.48		Do.
172	Grab.....	---	Tr	.26	1.6	Mn, >5.0*	Dump, Doctor Mine; pyrite, quartz in granite.
173	Grab.....	---	.01	.19	.20	Li, .02* Mn, >6.0*	Do.
174	Grab.....	.9	.01	.38	.20*	As, .05* Li, .02*	Do.
175	Chip, 47 in...	---	---	---	.02		Prospect pit; sericite, iron stained granite.
176	Random grab...	.3	---	.55	.11		Dump, caved adit; pyrite, sericite in altered granite.

Table 4.--Results of analyses of samples not shown in figures from the Vasquez Peak Wilderness Study Area--Continued

Sample No.	Type/Width	Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
177	Grab.....	---	---	0.06	0.07		Dump, caved adit; pyrite, sericite in altered granite.
178	Grab.....	0.3	---	.01	.02		Dump, caved adit; chlorite and sericite in altered granite.
179	Grab.....	.2	---	---	.01		Dump, caved adit; pyrite, rhyolite porphyry in altered granite.
180	Chip, 45 in...	---	---	---	.01		Across portal of flooded adit; pyrite in altered granite.
181	Grab.....	.5	---	.01	.01		Dump, caved adit; pyrite in locally silicified granite; upper 100 ft of dump slope.
182	Grab.....	.4	0.056	---	.01		Same as 181, lower 100 ft of dump slope.
183	Chip, 37 in...	.4	.005	---	.02		Prospect pit; heavily iron stained granite.
184	Chip, 36 in...	---	---	---	.01		Prospect pit; sericitized, altered granite.
185	Chip, 37 in...	.2	---	---	.01		Prospect pit; altered, weathered granite.
264	Grab.....	.3	---	.80	.98		Prospect pit; pyrite, fluorite in silicified granite and gneiss.
276	Grab.....	---	.4	---	---		Dump, caved adit; silicified granite and gneiss.
277	Chip, 30 in...	---	---	---	---		Prospect pit; pyrite in silicified granite.
278	Chip, 36 in...	.3	---	---	---		Prospect pit; pyrite, quartz blebs, and sericite in granite.
279	Grab.....	---	---	.01	.01		Dump, sloughed prospect pit; iron stained, silicified granite.

Table 6.--Results of analyses of samples not shown in figures
from the Yerington Paul Wilderness Study area--Continued

Sample No.	Type/Details	Ag (ppm)	Au (ppm)	Pb (ppm)	Zn (ppm)	Other (ppm)	Description
177	Grab.....	---	---	0.06	0.07		Dump, reved adit; pyrite, sericite in altered granite.
178	Grab.....	0.2	---	.01	.02		Dump, caved adit; chlorite and sericite in altered granite.
179	Grab.....	.2	---	---	.01		Dump, caved adit; pyrite, rhyolite porphyry in altered granite.
180	Chip, 15 in...	---	---	---	.01		Across portal of flooded adit; pyrite in altered granite.
181	Grab.....	.3	---	.01	.01		Dump, caved adit; pyrite in locally silicified granite; upper 100 ft of dump slope.
182	Grab.....	.4	0.058	---	.01		Same as 181, lower 100 ft of dump slope.
183	Chip, 30 in...	.4	.005	---	.02		Prospect pit; heavily iron stained granite.
184	Chip, 36 in...	---	---	---	.01		Prospect pit; sericitized, altered granite.
185	Chip, 30 in...	.1	---	---	.01		Prospect pit; altered, weathered granite.
186	Grab.....	.1	---	.80	.02		Prospect pit; pyrite, fluorite in silicified granite and quartz.
187	Grab.....	---	.4	---	---		Dump, caved adit; silicified granite and quartz.
188	Chip, 30 in...	---	---	---	---		Prospect pit; pyrite in silicified granite.
189	Chip, 36 in...	.1	---	---	---		Prospect pit; pyrite, quartz blebs, and sericite in granite.
190	Grab.....	---	---	.01	.01		Dump, sloughed prospect pit; iron stained, silicified granite.

Table 4.--Results of analyses of samples not shown in figures from the Vasquez Peak Wilderness Study Area--Continued

Sample No.	Type/Width	Ag	Au	Pb	Zn	Other	Description
		oz/ton		percent			
280	Chip, 38 in...	0.2	---	---	---		Quartz vein in granite.
281	Grab.....	1.8	---	0.01	0.01		Dump, sloughed prospect pit; magnetite in iron stained granite.
282	Grab.....	1.0	0.066	.01	.01		Dump, caved adit; heavily iron stained granite.
283	Grab.....	.9	---	.05	.02	U_3O_8, 0.0014	Dump, caved adit; pyrite, galena? in silicified granite.
284	Grab.....	.2	.1	.02	.01		Dump, caved adit; pyrite, specular hematite?, quartz veins in granite.
285	Grab.....	.5	---	.03	.01		Dump, caved adit; quartz veins in iron stained granite.
286	Chip, 36 in...	---	---	---	---		Prospect pit; quartz veins in granite.
287	Grab.....	.2	---	---	---		Prospect pit; silicified granite.
288	Grab.....	---	.3	.01	.01		Prospect pit; silicified, iron stained granite.
289	Grab.....	---	---	---	---		Prospect pit; amethyst in locally pegmatitic granite and gneiss.
290	Grab.....	2.6	---	.21	.01		Stockpile, caved adit; quartz veins in iron stained granite.
291	Grab.....	.3	---	.01	---		Prospect pit; abundant quartz veins in granite.
292	Grab.....	.9	---	.10	.01		Dump, caved adit; quartz veins in iron stained granite.

Table 4.--Results of analyses of samples not shown in figures from the Vasquez Peak Wilderness Study Area--Continued

Sample No.	Type/Width	Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
293	Grab.....	---	---	---	0.01		Prospect pit; pyrite in weathered granite.
294	Grab.....	0.3	---	0.01	.01		Dump, caved adit; quartz veins, pyrite, fluorite in granite.
295	Grab.....	1.0	---	.26	.31	Mo, 0.13	Stockpile from adit above; pyrite in granite.
302	Chip, 36 in...	---	---	---	---		Outcrop, granite; 200 cps on scintillometer.
303	Chip, 34 in...	---	---	---	---	U_3O_8, .004	Outcrop, granite; 500 cps on scintillometer.

*Determined by semiquantitative optical emission spectrography.

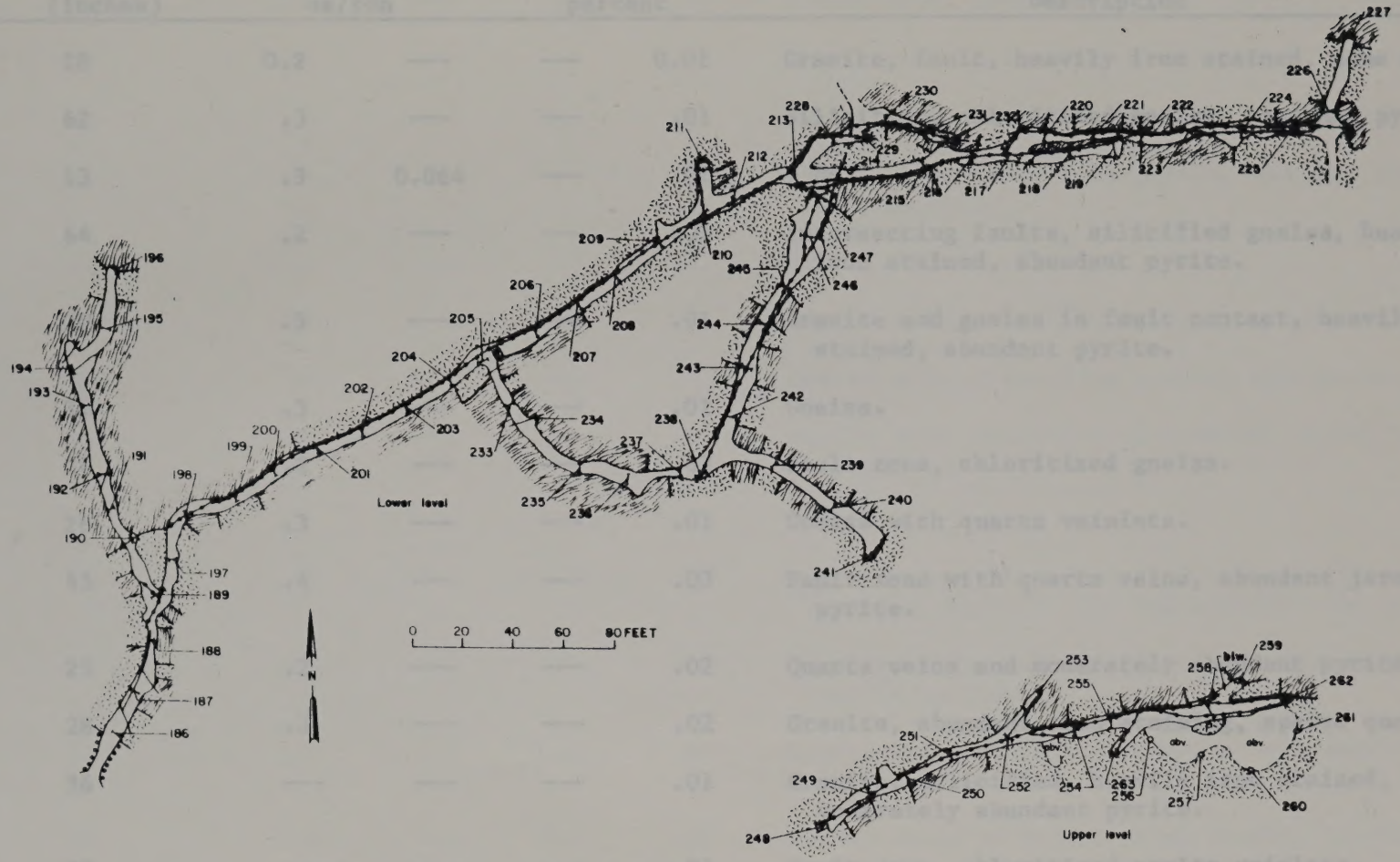


Figure 2.--The Puzzler Mine showing sample localities 186-263.

Table 5.--Results of analyses of samples from the Puzzler Mine

[---, not detected; <, less than]

Sample No.	Sample Length of chip (inches)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Description
186	28	0.2	---	---	0.01	Granite, fault, heavily iron stained, some quartz.
187	62	.3	---	---	.01	Silicified, chloritized gneiss, abundant pyrite.
188	43	.3	0.064	---	.01	Do.
189	64	.2	---	---	.01	Intersecting faults, silicified gneiss, heavily iron stained, abundant pyrite.
190	30	.5	---	---	.01	Granite and gneiss in fault contact, heavily iron stained, abundant pyrite.
191	34	.3	---	---	.01	Gneiss.
192	24	.2	---	---	.03	Fault zone, chloritized gneiss.
193	26	.3	---	---	.01	Gneiss with quartz veinlets.
194	45	.4	---	---	.03	Fault zone with quartz veins, abundant jarosite and pyrite.
195	25	.2	---	---	.02	Quartz veins and moderately abundant pyrite.
196	28	.3	---	---	.02	Granite, abundant iron staining, sparse quartz.
197	36	---	---	---	.01	Granite, silicified, heavily iron stained, sericite, moderately abundant pyrite.
198	39	---	---	---	.01	Fault zone, chloritized pyrite veinlets.
199	42	.4	---	---	.01	Quartz vein, hanging wall is silicified, abundant pyrite.
200	53	---	.040	---	---	Quartz vein, moderately iron stained, moderately abundant pyrite.

Table 5.--Results of analyses of samples from the Doepler Mine

[---, not detected; <, less than]

Sample No.	Length of chip (inches)	Analytical data				Description
		Ag	Au	Pb	Zn	
		ounces		percent		
186	28	0.2	---	---	0.01	Granite, fault, heavily iron stained, some quartz.
187	42	.2	---	---	.01	Silicified, chloritized gneiss, abundant pyrite.
188	43	.2	0.004	---	.01	Do.
189	24	.2	---	---	.01	Intersecting faults, silicified gneiss, heavily iron stained, abundant pyrite.
190	30	.2	---	---	.01	Granite and gneiss in fault contact, heavily iron stained, abundant pyrite.
191	14	.2	---	---	.01	Gneiss.
192	24	.2	---	---	.01	Fault zone, chloritized gneiss.
193	18	.3	---	---	.01	Gneiss with quartz veinlets.
194	43	.4	---	---	.03	Fault zone with quartz veins, abundant limonite and pyrite.
195	15	.1	---	---	.02	Quartz veins and moderately abundant pyrite.
196	28	.3	---	---	.02	Granite, abundant iron staining, sparse quartz.
197	36	---	---	---	.01	Granite, silicified, heavily iron stained, sericite, moderately abundant pyrite.
198	20	---	---	---	.01	Fault zone, chloritized pyrite veinlets.
199	42	.4	---	---	.01	Quartz vein, banding well in silicified, abundant pyrite.
200	52	---	.040	---	---	Quartz vein, moderately iron stained, moderately abundant pyrite.

Table 5.--Results of analyses of samples from the Puzzler Mine--Continued

Sample No.	Sample Length of chip (inches)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Description
201	30	---	---	---	0.01	Quartz vein, sparse pyrite.
202	39	---	---	---	.01	Quartz vein narrows to <1 in.
203	23	---	---	---	.01	Quartz vein, heavily iron stained, abundant pyrite.
204	26	---	0.012	---	.01	Quartz vein, silicified gneiss, abundant pyrite on hanging wall.
205	43	0.2	---	---	.01	Quartz vein.
206	46	---	---	---	.01	Quartz vein, silicified gneiss, abundant pyrite.
207	48	---	---	---	.01	Quartz vein, silicified gneiss, with minor pyrite.
208	48	.2	---	---	---	Quartz vein, heavily iron stained, limonite after pyrite.
209	44	.2	---	---	.03	Do.
210	73	.2	---	---	.01	Quartz vein at intersecting faults, silicified granite, heavily iron stained with abundant pyrite.
211	27	---	---	---	---	Granite at face of drift, heavily iron stained, sparse pyrite.
212	52	.2	---	0.11	.04	Quartz vein, silicified granite with moderately abundant pyrite.
213	69	---	---	---	.01	Quartz veins at intersecting faults, heavily iron stained, sparse pyrite.
214	37	.3	---	---	.01	Quartz vein, silicified granite, abundant sericite and pyrite.

Table 5.--Results of analyses of samples from the Puzzler Mine--Continued

Sample No.	Sample Length of chip (inches)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Description
215	42	0.3	---	---	0.01	Quartz vein, silicified wall rock with abundant pyrite.
216	47	.2	---	---	---	Do.
217	66	.4	---	0.01	.01	Quartz vein, silicified granite, heavily iron stained, abundant pyrite.
218	39	.3	---	---	.01	Quartz vein, silicified wall rock, heavily iron stained.
219	47	---	---	---	.01	Quartz vein, silicified granite, heavily iron stained with abundant pyrite.
220	46	.2	---	.02	.03	Do.
221	43	---	---	---	.01	Quartz vein, silicified gneiss, moderately iron stained, abundant pyrite.
222	42	.2	---	---	---	Do.
223	29	.2	---	---	---	Quartz vein, silicified wall rock.
224	69	.3	---	.11	.06	Quartz vein, silicified granite, heavily iron stained, abundant pyrite.
225	60	.3	---	---	.01	Quartz vein, silicified gneiss, heavily iron stained, abundant pyrite.
226	45	.2	---	---	.01	Do.
227	40	.3	---	.01	.03	Do.
228	42	.2	---	---	.01	Quartz vein, silicified granite, chloritized, abundant pyrite veinlets.
229	24	.2	---	.01	.02	Do.

Table 5.--Results of analyses of samples from the Puzzler Mine--Continued

Sample No.	Sample Length of chip (inches)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Description
230	46	---	---	---	0.01	Quartz vein, chloritized, minor pyrite.
231	37	0.3	---	---	.01	Do.
232	23	.4	---	0.02	.02	Do.
233	33	.4	---	---	.01	Gneiss.
234	33	.2	---	---	.01	Do.
235	35	.3	---	---	.02	Do.
236	48	---	---	---	.02	Do.
237	51	---	---	---	---	Granite.
238	30	.3	---	.01	.02	Granite with quartz vein.
239	42	.3	---	---	.01	Granite.
240	42	---	---	---	.02	Do.
241	30	.8	---	.01	.01	Quartz vein, heavily iron stained, abundant pyrite.
242	56	2.5	0.160	.02	.04	Do.
243	50	.2	.082	.03	.06	Quartz vein, heavily iron stained, abundant pyrite.
244	52	---	---	.01	.02	Quartz vein, heavily iron stained, abundant pyrite.
245	49	---	---	.02	.03	Quartz vein, silicified, abundant pyrite.
246	80	---	---	---	.01	Do.
247	110	.4	---	---	.02	Do.

Table 5.--Results of analyses of samples from the Puzzler Mine--Continued

Sample No.	Sample Length of chip (inches)	Analytical data Ag oz/ton	Au oz/ton	Pb percent	Zn percent	Description
248	46	0.2	---	---	0.02	Quartz vein, silicified granite, with minor pyrite, across wall of shaft, upper level.
249	37	.6	---	0.01	.01	Quartz vein, silicified granite, moderately iron stained, moderately abundant pyrite.
250	30	.4	---	.01	.01	Do.
251	37	.3	---	.01	.01	Same as 249 except silicified gneiss.
252	57	.8	---	.02	.01	Quartz vein, silicified wall rock, sparse pyrite,
253	22	.2	---	---	.02	Gneiss.
254	26	1.0	---	.01	.01	Quartz vein, silicified granite, heavily iron stained, moderately abundant pyrite.
255	34	1.0	0.014	.03	.02	Do.
256	24	3.3	.018	.01	.02	Do.
257	35	.7	.057	---	.01	Quartz vein, silicified granite, heavily iron stained, moderately abundant pyrite.
258	60	2.8	.036	.03	.02	Do.
259	41	1.8	.020	.03	.01	Quartz vein, silicified wall rock, abundant pyrite.
260	49	.7	---	.02	.1	Quartz vein, silicified granite, heavily iron stained, moderately abundant pyrite.
261	25	1.0	---	.01	.01	Do.
262	48	.4	---	.01	.01	Quartz vein, silicified wall rock, heavily iron stained, abundant pyrite.
263	30	.8	.010	---	.01	Quartz vein, silicified granite, heavily iron stained, abundant pyrite.

Table 5.--Results of analyses of samples from the Pueblo Dike--Continued

Sample No.	Length of chip (inches)	Analytical data				Description
		Ag oz/ton	Au	Pb	Zn	
			percent			
248	46	0.2	---	---	0.02	Quartz vein, silicified granite, with minor pyrite, across well of shaft, upper level.
249	37	.6	---	0.01	.01	Quartz vein, silicified granite, moderately iron stained, moderately abundant pyrite.
250	30	.4	---	.01	.01	Do.
251	31	.3	---	.01	.01	Same as 249 except silicified gneiss.
252	32	.8	---	.01	.01	Quartz vein, silicified wall rock, sparse pyrite.
253	33	.3	---	---	.02	Gneiss.
254	24	1.0	---	.01	.01	Quartz vein, silicified granite, heavily iron stained, moderately abundant pyrite.
255	24	1.0	0.014	.01	.01	Do.
256	24	3.3	.018	.01	.02	Do.
257	33	.7	.007	---	.01	Quartz vein, silicified granite, heavily iron stained, moderately abundant pyrite.
258	40	2.8	.016	.01	.02	Do.
259	41	1.8	.020	.01	.01	Quartz vein, silicified wall rock, abundant pyrite.
260	49	.7	---	.01	.1	Quartz vein, silicified granite, heavily iron stained, moderately abundant pyrite.
261	23	1.0	---	.01	.01	Do.
262	45	.4	---	.01	.01	Quartz vein, silicified wall rock, heavily iron stained, abundant pyrite.
263	30	.8	.010	---	.01	Quartz vein, silicified granite, heavily iron stained, abundant pyrite.

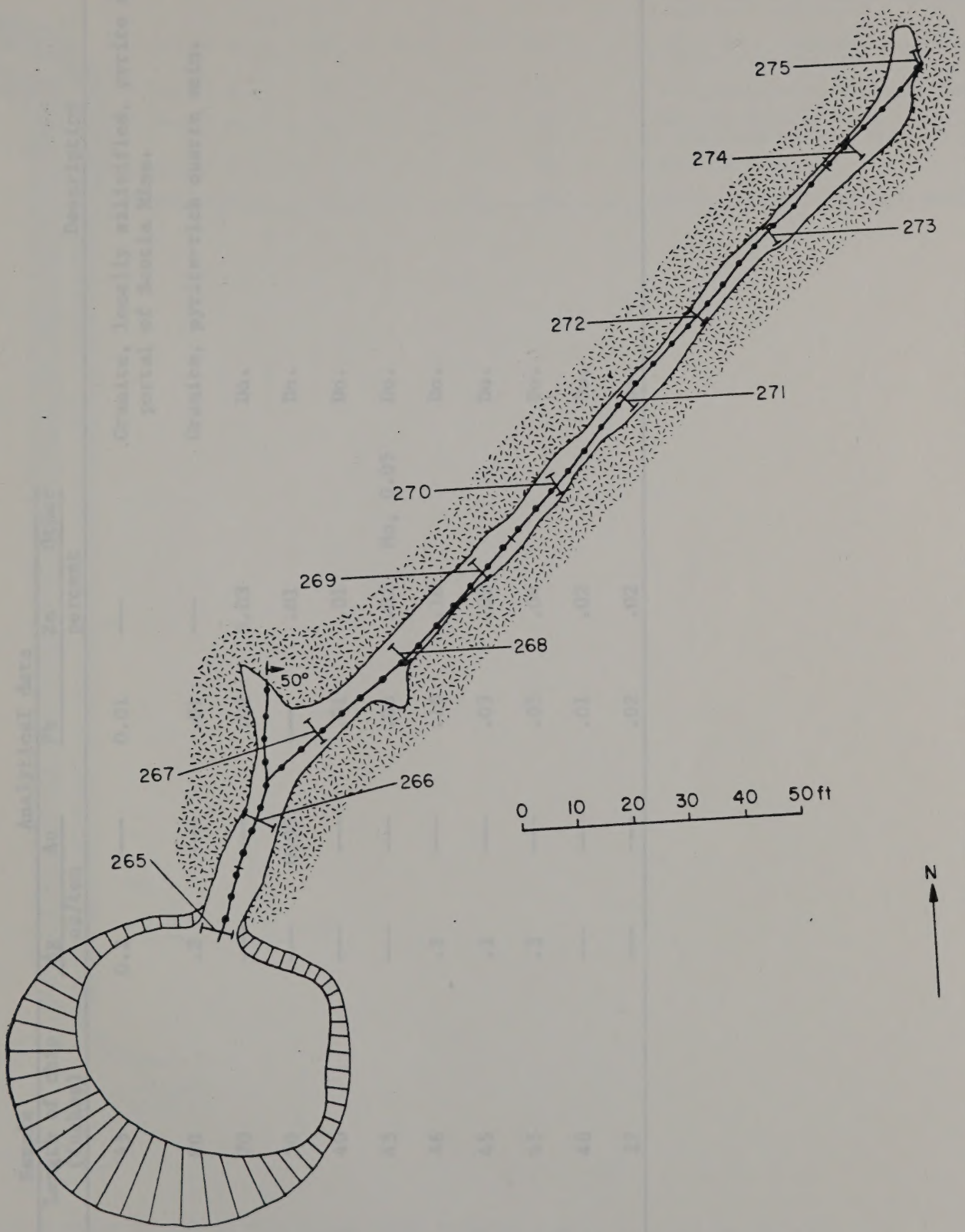


Figure 3.--Map of the Scotia Mine showing sample localities 265-275.

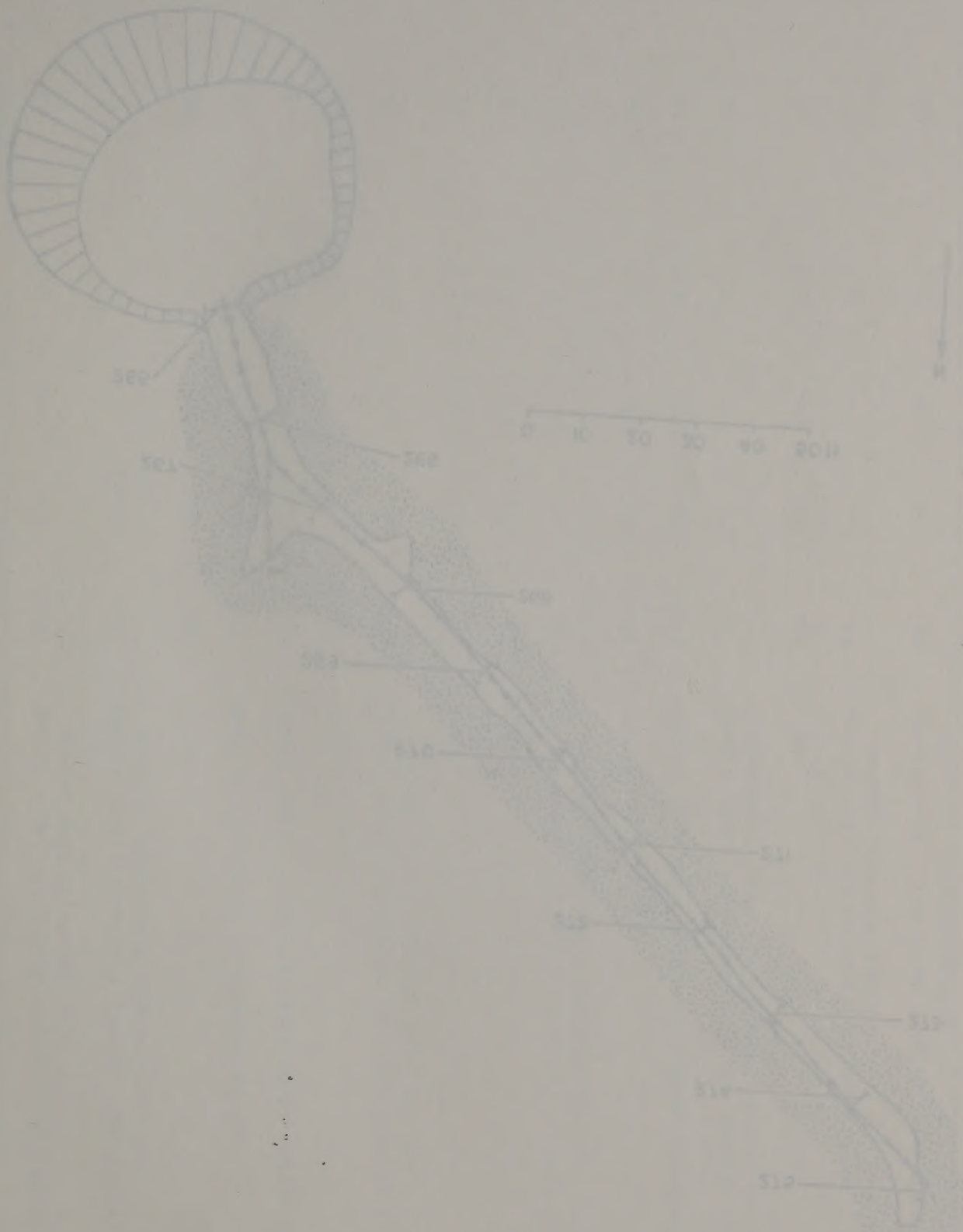


Table 6.-- Results of analyses from the Scotia Mine

[---, not detected]

Sample No.	Length of chip (inches)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
265	45	0.2	---	0.01	---		Granite, locally silicified, pyrite across portal of Scotia Mine.
266	80	.2	---	.01	---		Granite, pyrite-rich quartz vein.
267	70	---	---	.02	0.03		Do.
268	50	---	0.007	---	.01		Do.
269	40	---	---	.01	.01		Do.
270	45	---	---	.06	.02	Mo, 0.05	Do.
271	46	.2	---	.16	.16		Do.
272	45	.3	---	.03	.02		Do.
273	45	.3	---	.05	.04		Do.
274	48	---	---	.01	.02		Do.
275	27	---	---	.02	.02		Do.

Sample No.	Type/Width	Analytical data Ag oz/ton	Au	Pb percent	Zn	Other	Description
296	Random grab...	12.4	0.068	0.04	---		Granite, silicified, heavily iron stained, with quartz veins, dump of caved discovery adit above open adit.
297	Chip, 60 in...	1.4	.014	---	0.01		Gneiss, fresh, unaltered at portal of adit driven to intersect vein.
298	Chip, 17 in...	.2	---	---	.01		Fault zone in gneiss, parallel to foliation.
299	Chip, 24 in...	.3	---	---	.01		Fault zone in gneiss, heavily iron stained, stoped up approximately 20 ft.
300	Chip, 12 in...	---	---	---	.01		Fault zone in gneiss.
301	Chip, 46 in...	---	---	---	.03		Gniess, moderately iron stained, chlorite.

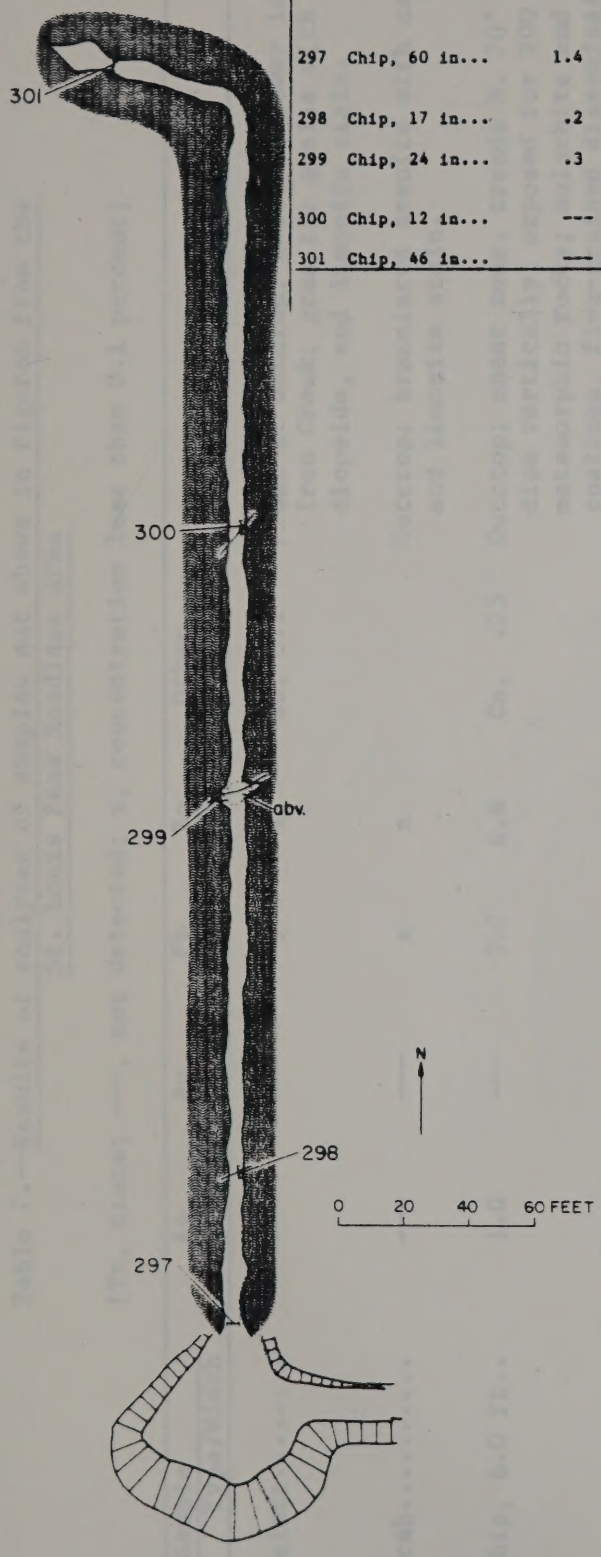


Figure 4.--Map of the Little Alice Mine showing sample localities 297-301. Symbols used on the analytical data table are: ---, not detected.

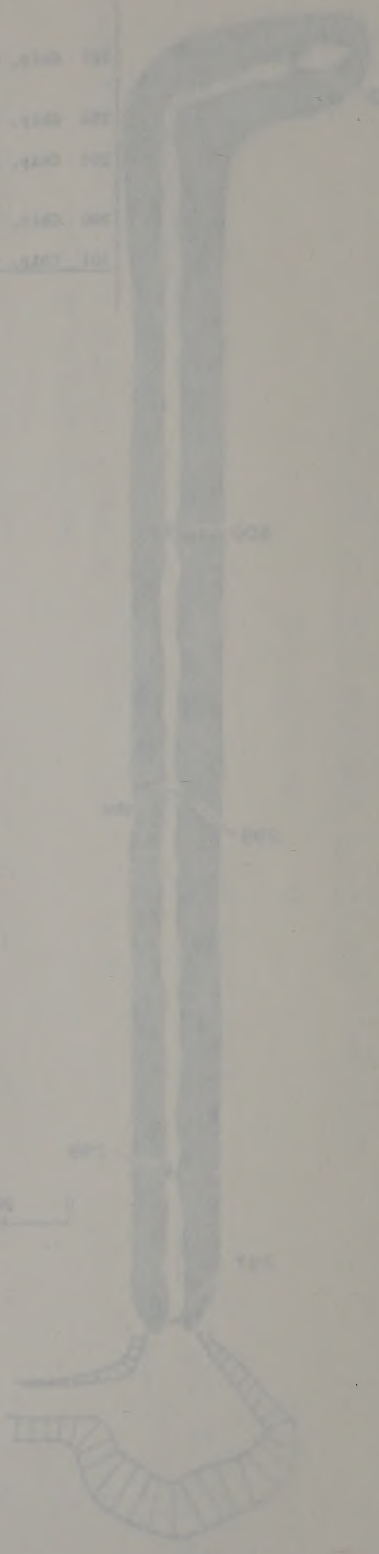


Table 7.--Results of analyses of samples not shown in figures from the St. Louis Peak Roadless Area

[Tr, trace; ---, not detected; x, concentration less than 0.1 percent]

Sample No.	Type/Width	Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
1	Select.....	---	---	x	x	Sb, 0.1	Float at outcrop, north of lower lake on Iron Creek; granitic gneiss with garnet, diopside, and limonite stain.
2	Grab.....	---	---	x	x		Outcrop; brecciated granite with calcite and limonite stain.
6	Chip, 6.0 ft..	1.0	---	2.7	6.6	Cu, .25	Outcrop; shear zone, trends N. 70° W., dips vertically, exposed for 200 ft in metamorphic rocks; malachite and azurite coatings, fine-grained disseminated pyrite, limonite stain, calcite and gypsum(?) matrix.
12	Chip 1.5 ft...	---	Tr	x	x		Prospect pit, 7 x 7 ft wide, shallow depth; 0.5-ft- wide quartz vein, with pyrite and heavy limonite stain in granite.
13	Chip, 6.0 ft..	.3	---	.18	x		Prospect pit; shear zone, trends N. 50° W., dips vertically; limonite stained granite.
14	Chip, 6.0 ft..	---	---	x	x	La, .03 V, .02	Prospect pit; shear zone, trends N. 90° W., dips vertically; limonite stained granite gneiss.
15	Chip, random.....	---	---	x	x	Ba, .2	Outcrop; scattered quartz-rich zones, 0.1 ft maximum width; limonite stain in schist and gneiss.
16	Grab.....	---	---	x	x		Dump, float-filled trench; in granite.
17	Grab.....	---	---	x	x	Ba, .1	Dump, float-filled prospect pit; limonite-stained granite.

No.	Sample: Length of chip (feet)	Analytical data: Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
7	1.5	---	---	x	0.15	Li, 0.03	Fault, 0.5-0.8 ft wide; clay, quartz, diopside, limonite stain, in biotite schist.
8	3.0	---	Tr	x	.10	As, .06 Li, >.08	Quartz zone in biotite schist.
9	3.0	0.8	0.01	x	.33	Cu, .6	Veinlets and disseminations of pyrite in quartz and diopside.
10	3.0	Tr	Tr	x	x	Li, .03	Biotite schist.
11	3.0	1.8	Tr	3.5	6.3	Cd, .1 Cu, .21	Calcite and very fine grained gray sulfides.

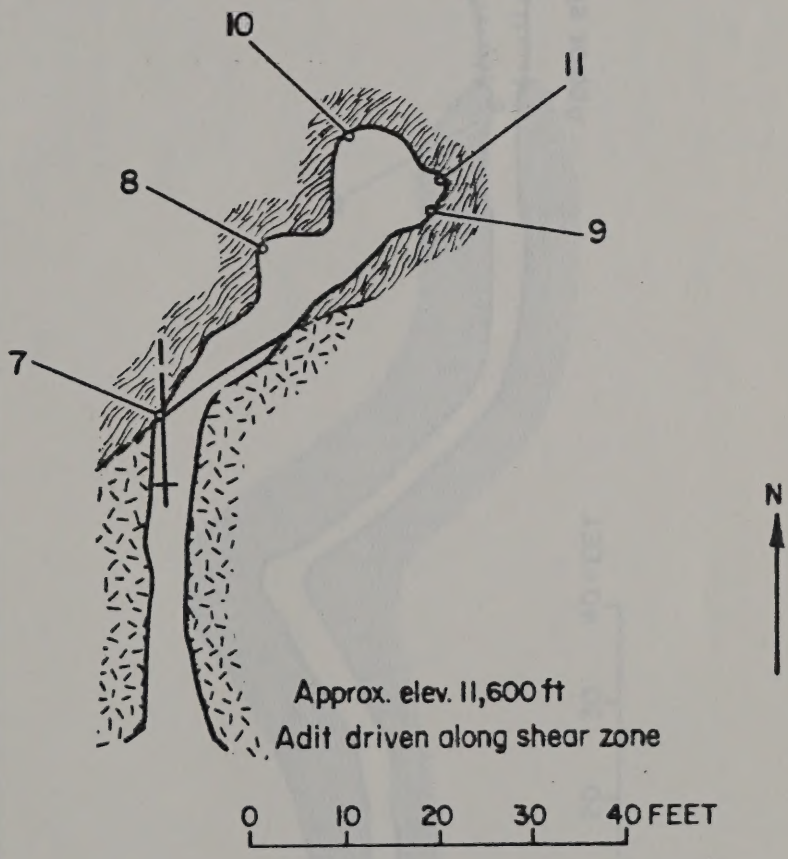


Figure 5.--Map of the St. Louis Mine showing sample localities 7-11. Symbols used on the analytical data table are: Tr, trace; ---, not detected; x, concentration less than 0.1 percent; >, greater than.

Sample No.	Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
3	Grab.....	Tr	---	x	x		Dump; fine-grained pyrite, pegmatite veinlets in hornblende gneiss.
4	Chip, 3.0 ft..	0.5	---	x	x	Li, 0.009	Pegmatite veinlets, in hornblende gneiss.
5	Chip, random.....	---	---	x	x	Li, .01 Ni, .01 V, .02	Do.

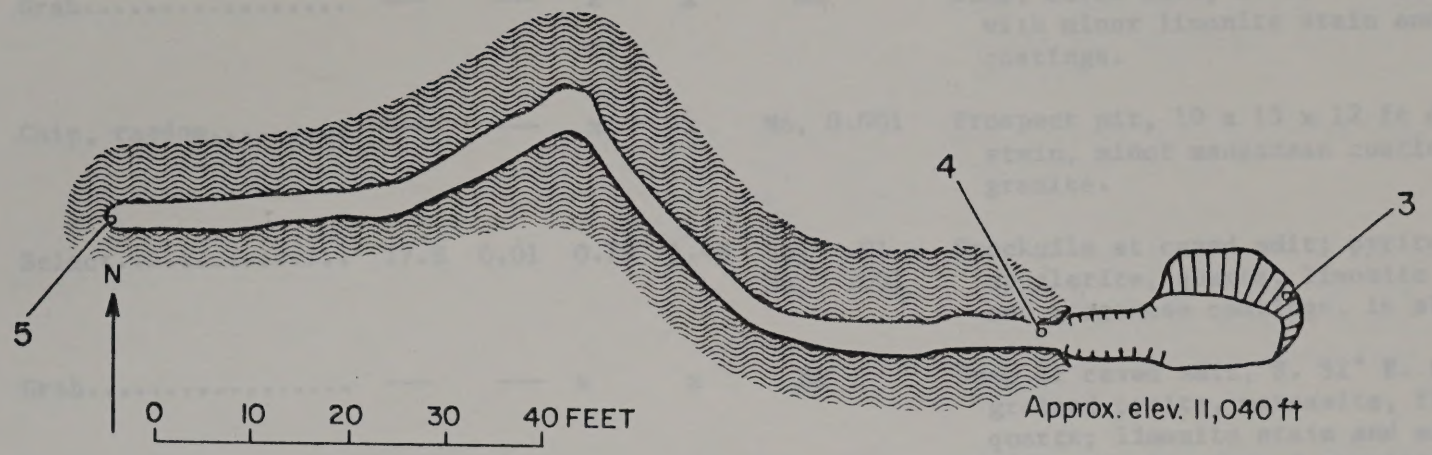


Figure 6.--Map of the Iron Creek Mine showing sample localities 3-5. Symbols used on the analytical data table are: Tr, trace; ---, not detected; x, concentration less than 0.1 percent.

Table 8.--Results of analyses of samples not shown in figures from the Williams Fork Roadless Area

[Tr, trace; ---, not detected; x, concentration less than 0.1 percent; NA, not applicable; >,greater than]

Sample No.	Sample Type/Width	Ag oz/ton	Au oz/ton	Pb percent	Zn percent	Other percent	Description
18	Grab.....	---	---	x	x	NA	Dump, caved adit, N. 15° W. trend; quartz, disseminated pyrite, limonite stain, in gneiss and granite.
19	Grab.....	---	---	x	x	NA	Dump, float-filled prospect pit; 6 x 6 x 6 ft deep; quartz veinlet, with minor pyrite, limonite stain, in altered granite.
20	Grab.....	---	---	x	x	NA	Dump, caved adit, S. 80° W. trend; granite, with minor limonite stain and manganese coatings.
39	Chip, random.....	---	---	x	x	Mo, 0.001	Prospect pit, 10 x 15 x 12 ft deep; limonite stain, minor manganese coatings, in altered granite.
40	Select.....	17.8	0.01	0.79	1.46	La, .01 Mo, .001	Stockpile at caved adit; pyrite, fluorite, sphalerite, quartz, limonite stain and manganese coatings, in altered granite.
41	Grab.....	---	---	x	x	NA	Dump at caved adit, S. 52° E. trend; fine-grained pyrite, marcasite, fluorite, drusy quartz; limonite stain and manganese coatings, in altered granite.
42	Grab.....	---	---	x	x	Mo, .001	Dump, caved adit; fluorite, quartz, limonite stain and manganese coatings, in altered granite.
47	Chip, 0.8 ft.....	---	---	x	x	NA	Prospect pit, 4 x 7 x 8 ft deep; fault, N. 62° E. trend, 78° NW dip; clay, quartz, limonite stain and manganese coatings, in fractured, altered granite.

Table 8.--Results of analyses of samples not shown in figures from the Williams Fork Roadless Area--Continued

No.	Sample Type/Width	Ag oz/ton	Au oz/ton	Pb percent	Zn percent	Other percent	Description
48	Grab.....	0.1	---	x	x	NA	Dump, caved adit; pyrite, with limonite stain and manganese coatings, in altered granite.
49	Grab.....	1.7	Tr	x	x	NA	Dump, caved adit; pyrite, with limonite stain and manganese coatings, in altered granite.
50	Grab.....	.6	---	x	x		Do.
51	Grab.....	1.3	---	x	x		Dump, caved adit; pyrite, quartz, limonite stain and manganese coatings, in altered granite.
52	Select.....	2.0	---	1.10	1.35	As, 0.1 Cd, .05 Mo, .005	Best-looking vein material from dump described above.
53	Chip, 0.5 ft.....	---	---	x	x	La, .02	Adit, S. 76° W. trend, 10 ft long; shear zone, N. 5° E. trend, 82° NW dip, zone is 0.3 ft wide at sample locality; limonite stain and manganese coatings, in altered granite.
54	Select.....	35.0	---	.65	2.22	La, .02 Mo, .003	Stockpile, caved adit; sphalerite, galena, pyrite, limonite stain and manganese coatings, in altered granite.
93	Grab.....	.2	---	x	x	La, .02	Dump, float-filled pit; limonite stained, altered granite.
94	Chip, 3.0 ft.....	---	---	x	x	As, .05 Li, .03 U_3O_8, .004	Prospect pit N. 80° E. trend, 5 ft long; shear zone, N. 80° E. trend, 50° NW dip; limonite stained, altered granite; sample across south half of face.

Table 8.--Results of analyses of samples not shown in figures from the Williams Fork Roadless Area--Continued

Sample No.	Sample Type/Width	Ag oz/ton	Au oz/ton	Pb percent	Zn percent	Other percent	Description
95	Chip, 2.5 ft.....	---	---	x	x	Li, 0.03 U_3O_8,.007	Same as sample no. 94; sample across north half of face.
96	Chip, 4.0 ft.....	0.2	0.02	x	x	La, .02	Caved adit; limonite stain and manganese coatings in granite; sample across portal.
104	Select.....	1.0	---	0.1	x	La, .02	Stockpile, two prospect pits and mill-site; limonite stain and manganese coatings in altered granite.
122	Chip, 8.0 ft.....	---	---	x	x	Ba, .1	Prospect pit; shear zone, south trend, 84° W. dip; limonite stained, altered granite.
132	Grab.....	---	.01	x	x	As, .05	Float-filled prospect pit; limonite stain and manganese coatings in granite.
133	Grab.....	.1	Tr	.30	0.25	Li, .02	Dump, caved adit; limonite stained, altered granite.
134	Grab.....	---	Tr	x	x		Do.
145	Chip, 2.6 ft.....	---	---	.17	.15	Mn,>10.0	Prospect pit, 10 x 8 ft, depth unknown, partly caved; fault, N. 85° W. trend, 48° NE dip, 1.2 ft wide; clay, limonite stain and manganese coatings, in fractured and altered granite.
150	Grab.....	---	---	x	x		Dump, caved adit; quartz, limonite stain, in granite and pegmatite.
304	Chip, random.....	---	---	x	x		Outcrop; limonite-stained quartzite.
305	Grab.....	---	---	x	x		Dump; float-filled trench; calcite stringers, minor limonite stain in limestone and siltstone.

*Determined by semiquantitative optical emission spectrography.

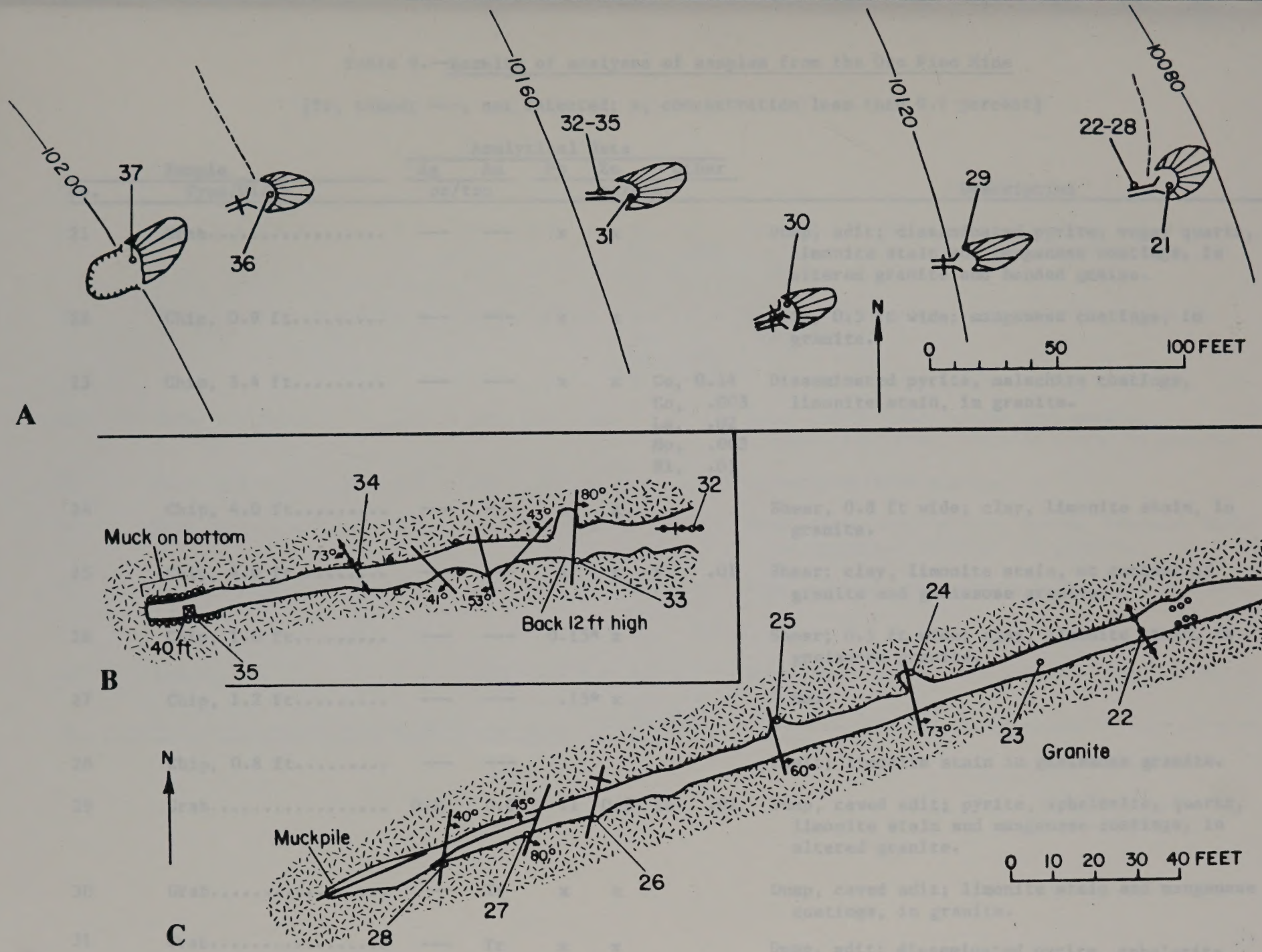


Figure 7A.--Map of the Oro Fino Mine showing sample localities 21-37. B.--Upper adit. C.--Lower adit.

Table 9.--Results of analyses of samples from the Oro Fino Mine

[Tr, trace; ---, not detected; x, concentration less than 0.1 percent]

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
21	Grab.....	---	---	x	x		Dump, adit; disseminated pyrite, vuggy quartz, limonite stain and manganese coatings, in altered granite and banded gneiss.
22	Chip, 0.9 ft.....	---	---	x	x		Vein, 0.5 ft wide; manganese coatings, in granite.
23	Chip, 3.4 ft.....	---	---	x	x	Cu, 0.14 Co, .003 La, .02 Mo, .003 Ni, .01	Disseminated pyrite, malachite coatings, limonite stain, in granite.
24	Chip, 4.0 ft.....	---	---	x	x		Shear, 0.8 ft wide; clay, limonite stain, in granite.
25	Chip, 4.0 ft.....	---	---	x	x	V, .01	Shear; clay, limonite stain, at contact of granite and gneissose granite.
26	Chip, 1.0 ft.....	---	---	0.15*	x		Shear; 0.5 ft wide; clay, limonite stain, in gneissose granite.
27	Chip, 1.2 ft.....	---	---	.15*	x		Do.
28	Chip, 0.8 ft.....	---	---				Fault; limonite stain in gneissose granite.
29	Grab.....	0.2	0.01	.1	0.3	La .02	Dump, caved adit; pyrite, sphalerite, quartz, limonite stain and manganese coatings, in altered granite.
30	Grab.....	---	Tr	x	x		Dump, caved adit; limonite stain and manganese coatings, in granite.
31	Grab.....	---	Tr	x	x		Dump, adit; disseminated pyrite, sphalerite, quartz, in granite.

Table 9.--Results of analyses of samples from the Ore Trio mine

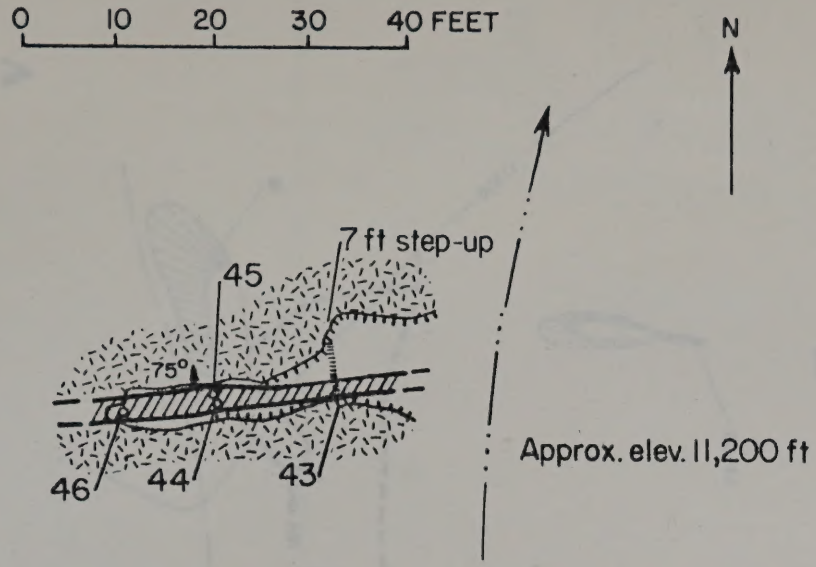
[Tr, trace; ---, not detected; x, concentration less than 0.1 percent]

Sample No.	Type/Width	Analyzed data: Ag (ppm)	Au (ppm)	Pb (%)	Zn (%)	Other (percent)	Description
21	Grab.....	---	---	---	x	x	Dump, adit; disseminated pyrite, sugary quartz, limonite stain and manganese coatings, in altered granite and banded gneiss.
22	Chip, 0.9 ft.....	---	---	---	x	x	Vein, 0.5 ft wide; manganese coatings, in granite.
23	Chip, 3.4 ft.....	---	---	---	x	x	Ca, 0.14 Co, .003 La, .02 Mo, .003 Ni, .01	Disseminated pyrite, scattered coatings, limonite stain, in granite.
24	Chip, 4.0 ft.....	---	---	---	x	x	Shear, 0.8 ft wide; clay, limonite stain, in granite.
25	Chip, 4.0 ft.....	---	---	---	x	x	V, .01	Shear, clay, limonite stain, at contact of granite and pegmatoss granite.
26	Chip, 1.0 ft.....	---	---	---	0.15%	x	Shear; 0.5 ft wide; clay, limonite stain, in pegmatoss granite.
27	Chip, 1.2 ft.....	---	---	---	.15%	x	Do.
28	Chip, 0.8 ft.....	---	---	---			Fault; limonite stain in pegmatoss granite.
29	Grab.....	0.2	0.01	.1	0.3	La .02	Dump, caved adit; pyrite, sphalerite, quartz, limonite stain and manganese coatings, in altered granite.
30	Grab.....	---	Tr	x	x		Dump, caved adit; limonite stain and manganese coatings, in granite.
31	Grab.....	---	Tr	x	x		Dump, adit; disseminated pyrite, sphalerite, quartz, in granite.

Table 9.--Results of analyses of samples from the Oro Fino Mine--Continued

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
32	Chip, 1.8 ft.....	0.9	0.012	0.39	x	As, 0.5 Mo, .002	Vein, 0.7 ft wide; quartz veinlets and disseminated sulfides, clay, limonite stain, in altered granite.
33	Chip, 5.0 ft.....	---	---	.1*	x	Cu, .1 Ba, .1 Mo, .003 V, .01	Shear, 2.0 ft wide; clay, limonite stain, in granite.
34	Chip, 1.4 ft.....	2.4	.03	x	.11		Vein, 1.0 ft wide; quartz with pyrite, sphalerite, clay, limonite stain, in granite.
35	Chip, 2.0 ft.....	2.8	.01	.4*	x		Limonite-stained granite.
36	Grab.....	1.5	---	x	x		Dump, caved adit; pyrite, quartz, limonite stain, and manganese coatings, in granite.
37	Grab.....	---	.02	x	0.16	As, 1.0 Ba, .1 Mo, .001	Dump, prospect pit; sample description as above.
38	Select.....	2.1	.096	.43	2.3	As, 2.0 Li, .2 Mn>10.0	Dump; best-looking vein material, from all dumps in group.

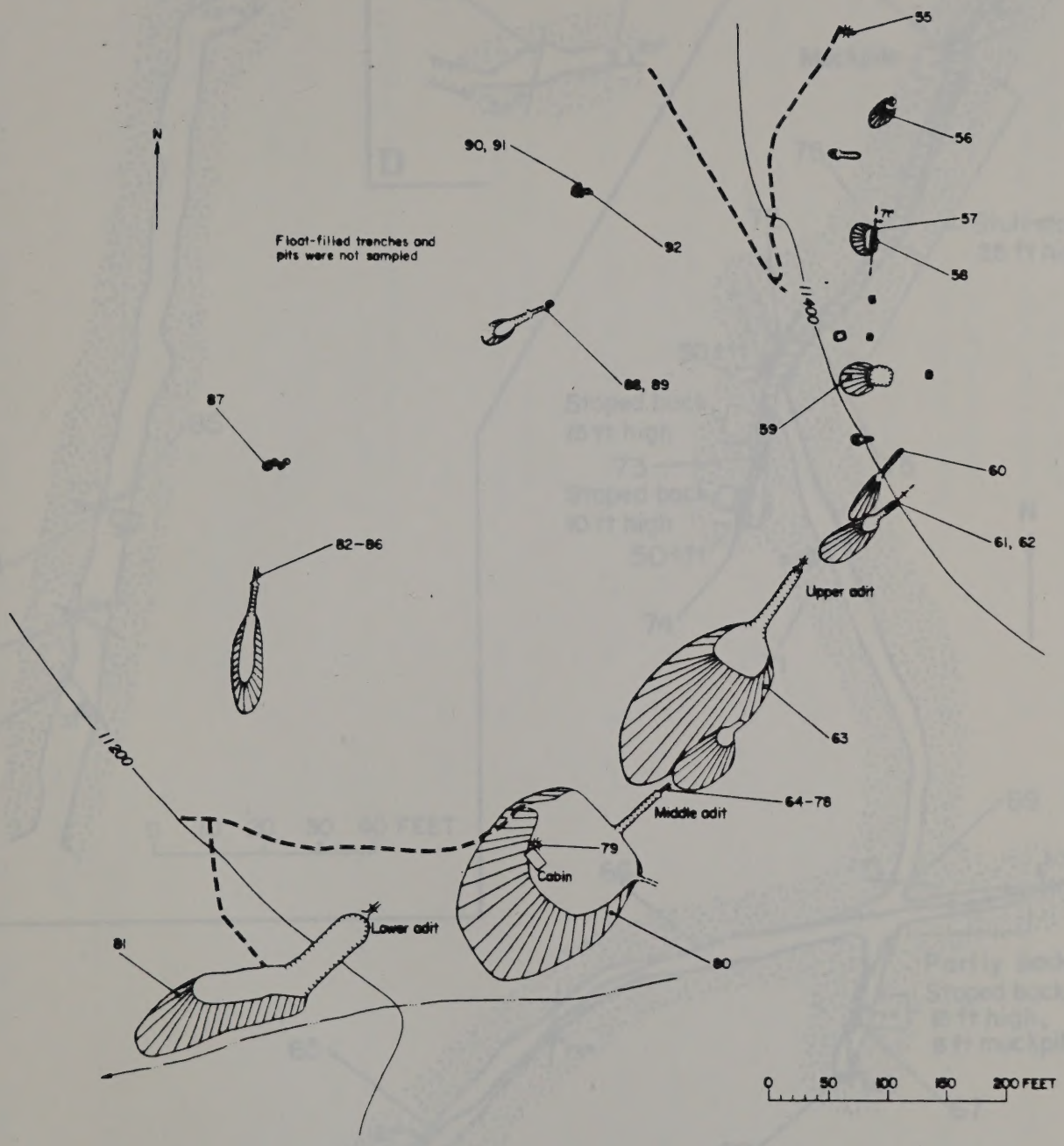
*Determined by semiquantitative optical emission spectrography.



Sample No.	Length of chip (feet)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Description
43	1.6	2.3	---	x	x	Fault, 5.0 ft wide; clay, limonite stain, manganese veinlets in fractured, bleached granite.
44	1.3	1.1	---	0.2*	x	Fault, 2.7 ft wide; minor pyrite, clay, limonite stain, manganese stain, in fractured, altered granite; sample from south part of fault.
45	1.5	---	---	x	x	Fault, as above; sample from northernmost exposure; quartz, clay, limonite stain and manganese coatings, in fractured, altered granite.
46	2.0	.4	---	x	0.12	Fault, 2.0 ft wide; clay, limonite stain and manganese coatings, in fractured, altered granite.

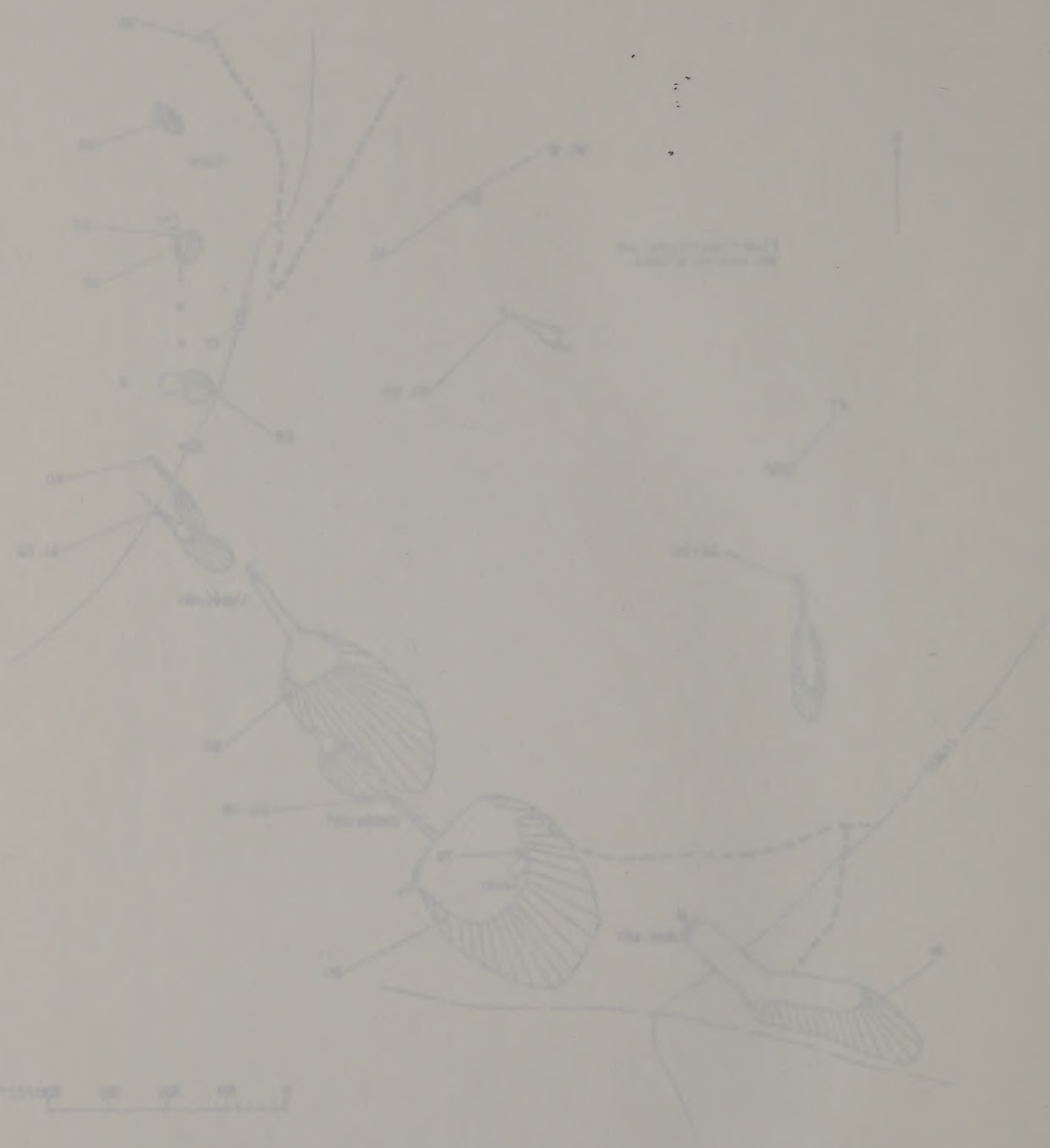
*Determined by semiquantitative optical emission spectrography.

Figure 8.--Map of the No Name prospect showing sample localities 43-46. Symbols used on the analytical data table are: ---, not detected; x, concentration less than 0.1 percent.



A

Figure 9A.--Map of the Ready Cash Mine showing sample localities 55-92. B.--Middle adit. C.--West adit. D.--North adit.



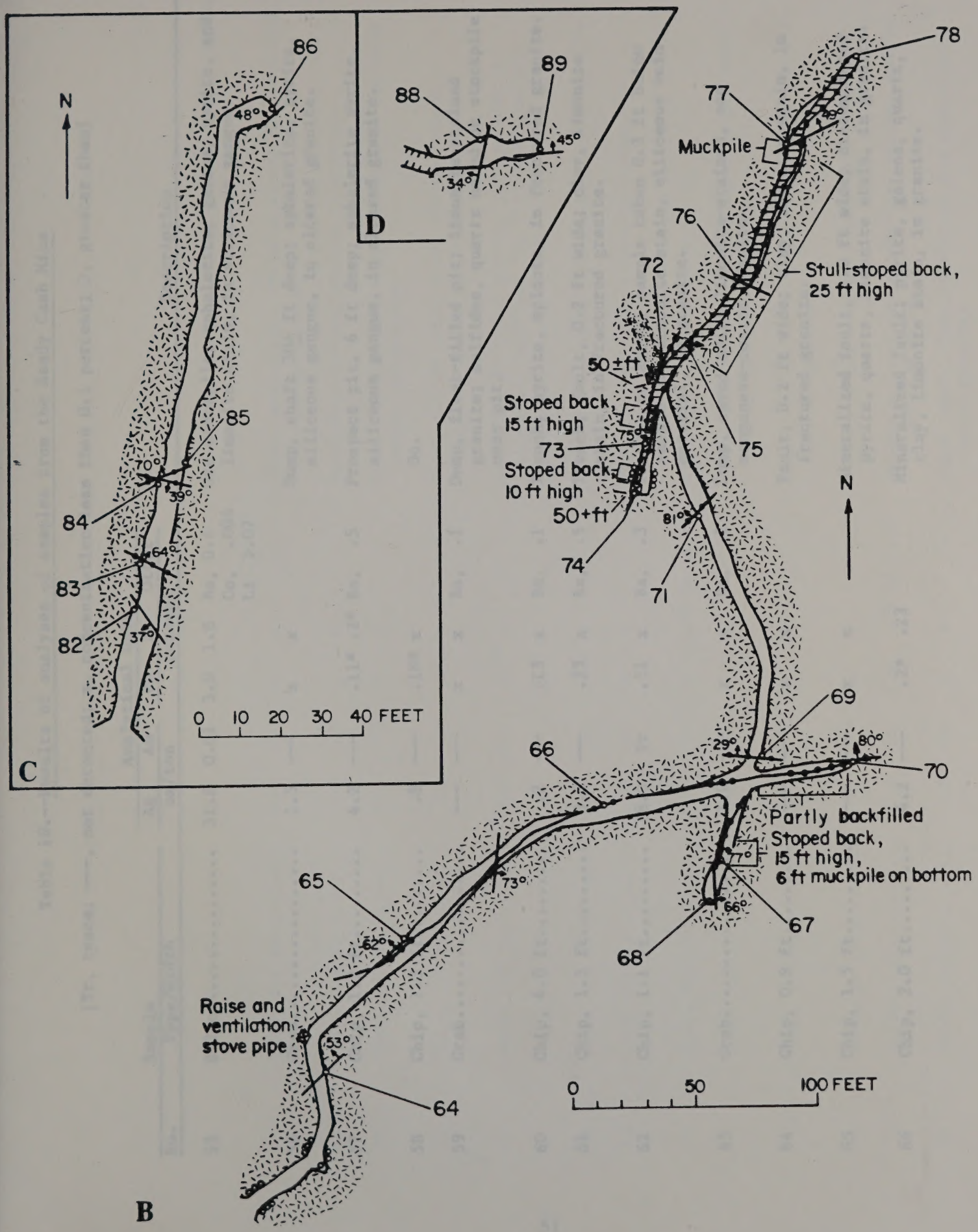

N
86
48°
85
70°
39°
84
64°
83
82
37°
0 10 20 30 40 FEET
C
D
88
89
45°
34°
78
77
Muckpile
76
72
Stull-stoped back,
25 ft high
50±ft
Stoped back,
15 ft high
75°
73
Stoped back,
10 ft high
50+ft
74
81°
71
75
N
69
66
29°
80°
70
Partly backfilled
Stoped back,
15 ft high,
6 ft muckpile on bottom
7°
65
73°
66°
67
68
62°
Raise and
ventilation
stove pipe
53°
64
0 50 100 FEET
B

Table 10.--Results of analyses of samples from the Ready Cash Mine

[Tr, trace; ---, not detected; x, concentration less than 0.1 percent; >, greater than]

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
55	Select.....	31.8	0.01	3.0	1.8	Ba, 0.6 Co, .004 Li >.07	Ore stockpile; sphalerite, galena, pyrite, and limonite stain, in siliceous gangue.
56	Grab.....	1.5	---	x	x		Dump, shaft 30± ft deep; sphalerite, pyrite, siliceous gangue, in altered granite.
57	Chip, 1.3 ft.....	4.2	---	.11*	.2*	Ba, .5	Prospect pit, 6 ft deep; sphalerite pyrite, siliceous gangue, in altered granite.
58	Chip, 1.3 ft.....	.8	---	.18*	x		Do.
59	Grab.....	---	---	x	x	Ba, .1	Dump, float-filled pit; limonite-stained granite; sulfides, quartz noted on stockpile near pit.
60	Chip, 4.0 ft.....	.2	---	.13	x	Ba, .1	Trench; pyrite, epidote, in fractured granite.
61	Chip, 1.3 ft.....	3.0	---	.23	x	Ba, .5	Trench; fault, 0.2 ft wide; clay, limonite stain, in fractured granite.
62	Chip, 1.1 ft.....	18.0	Tr	.51	x	Ba, .3	Trench; as above; sample taken 0.3 ft below sample 61; limonite stain, siliceous vein material, in granite.
63	Grab.....	1.6	---	x	x	Ba, .1	Dump, caved adit; limonite-stained, and manganese-coated granite.
64	Chip, 0.9 ft.....	---	---	x	x		Fault, 0.2 ft wide; clay, limonite stain, in fractured granite.
65	Chip, 1.5 ft.....	---	---	x	x		Mineralized fault, 1.0 ft wide; disseminated pyrite, quartz, limonite stain, in granite.
66	Chip, 2.0 ft.....	4.2	---	.2*	.23		Mineralized fault; pyrite, galena, quartz, clay, limonite stain, in granite.

Table 10.--Results of analyses of samples from the Ready Cash Mine--Continued

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
67	Chip, 2.0 ft.....	4.2	---	1.25	x		Vein, 2.5 ft wide; galena, quartz, clay, limonite stain, in granite.
68	Chip, 5.0 ft.....	---	---	x	x		Shear zone; clay, limonite stain, in fractured, decomposed granite.
69	Chip, 0.8 ft.....	---	---	x	x		Vein, 0.3 ft wide; quartz in granite.
70	Chip, 3.3 ft.....	---	---	x	x		Vein, 0.1 ft wide; siliceous gangue, limonite stain, in granite.
71	Chip, 1.9 ft.....	.2	---	.12	x		Vein, 1.5 ft wide; minor pyrite, quartz, limonite stain, in granite.
72	Chip, 1.1 ft.....	29.0	Tr	.14*	x		Vein, 0.2 ft wide; pyrite, galena, quartz, manganese coatings, in fractured granite; vein splits at mid-rib.
73	Chip, 1.1 ft.....	1.6	Tr	.16*	x		Vein, 0.7 ft wide; galena, quartz, in granite.
74	Chip, 2.0 ft.....	.4	---	x	x		Vein, 0.5 ft wide; siliceous gangue, in granite.
75	Chip, random.....	1.6	---	x	1.0*	Co, 0.05	Vein; quartz in granite.
76	Chip, 1.3 ft.....	5.4	---	.33	x		Fault, 0.8 ft wide; disseminated gray mineral, quartz, clay, in granite.
77	Chip, 1.8 ft.....	---	---	x	x		Fault, 0.7 ft wide; siliceous gangue, clay, in altered granite.
78	Chip, 3.5 ft.....	---	---	x	x		Pegmatite veins, 4.0 ft wide zone in granite.
79	Select.....	42.2	Tr	1.61	.55	Ba,>1.0	Stockpile; pyrite, sphalerite, galena, quartz, in altered granite.
80	Grab.....	1.8	---	x	x		Dump, adit; limonite-stained and manganese-coated granite.

| | | |

Table 10.--Results of analyses of samples from the Ready Cash Mine--Continued

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
81	Grab.....	---	---	x	x		Dump, caved adit; limonite-stained and manganese-coated granite.
82	Chip, 1.0 ft.....	---	---	x	x		Shear, 0.5 ft wide; limonite-stained granite.
83	Chip, 0.7 ft.....	---	---	x	x		Vein, 0.3 ft wide; limonite-stained granite.
84	Chip, 0.3 ft.....	---	---	x	x		Vein, 0.1 ft wide; siliceous gangue, limonite stain, in granite.
85	Chip, 0.7 ft.....	0.2	---	x	x		Vein, 0.5 ft wide; clay, in limonite-stained granite.
86	Chip, 0.7 ft.....	---	---	x	x		Vein, 0.3 ft wide; quartz, in granite.
87	Grab.....	---	---	x	x		Dump, float-filled pits; limonite-stained granite.
88	Chip, 1.0 ft.....	---	---	x	x		Shear zone, 0.7 ft wide; limonite-stained granite.
89	Chip, 1.5 ft.....	---	---	x	x		Fracture zone, 1.0 ft wide; contains quartz vein 0.3 ft wide, limonite stain, in granite.
90	Grab.....	---	---	x	x		Dump, prospect pit; limonite-stained granite.
91	Grab.....	.2	---	x	x		Dump; as above.
92	Chip, 4.3 ft.....	---	---	x	x		Prospect pit; same working as above; clay, in limonite-stained granite.

*Determined by semiquantitative optical emission spectrography.

No.	Sample Type/Width	Ag oz/ton	Au oz/ton	Pb percent	Zn percent	Other percent	Description
97	Grab.....	---	---	x	x		Dump, float-filled trench; limonite-stained, altered granite.
98	Grab.....	0.2	---	0.1*	x	Ba, 0.1	Dump, caved adit; galena, limonite stain, manganese coatings, in altered granite.
99	Grab.....	.8	---	.45*	0.3*		Dump, shaft; sample description as above.
100	Grab.....	---	---	x	x	Ba, .1	Dump, float-filled trench; limonite-stained granite.
101	Chip, 2.3 ft.....	---	---	x	x		Prospect pit; clay, limonite stain, in granite.
102	Chip, 1.5 ft.....	---	---	x	x		Prospect pit; fault, 0.5 ft wide; clay, limonite stain, in granite.
103	Grab.....	.1	---	x	x		Dump, caved adit; limonite-stained, altered granite.

*Determined by semiquantitative optical emission spectrography.

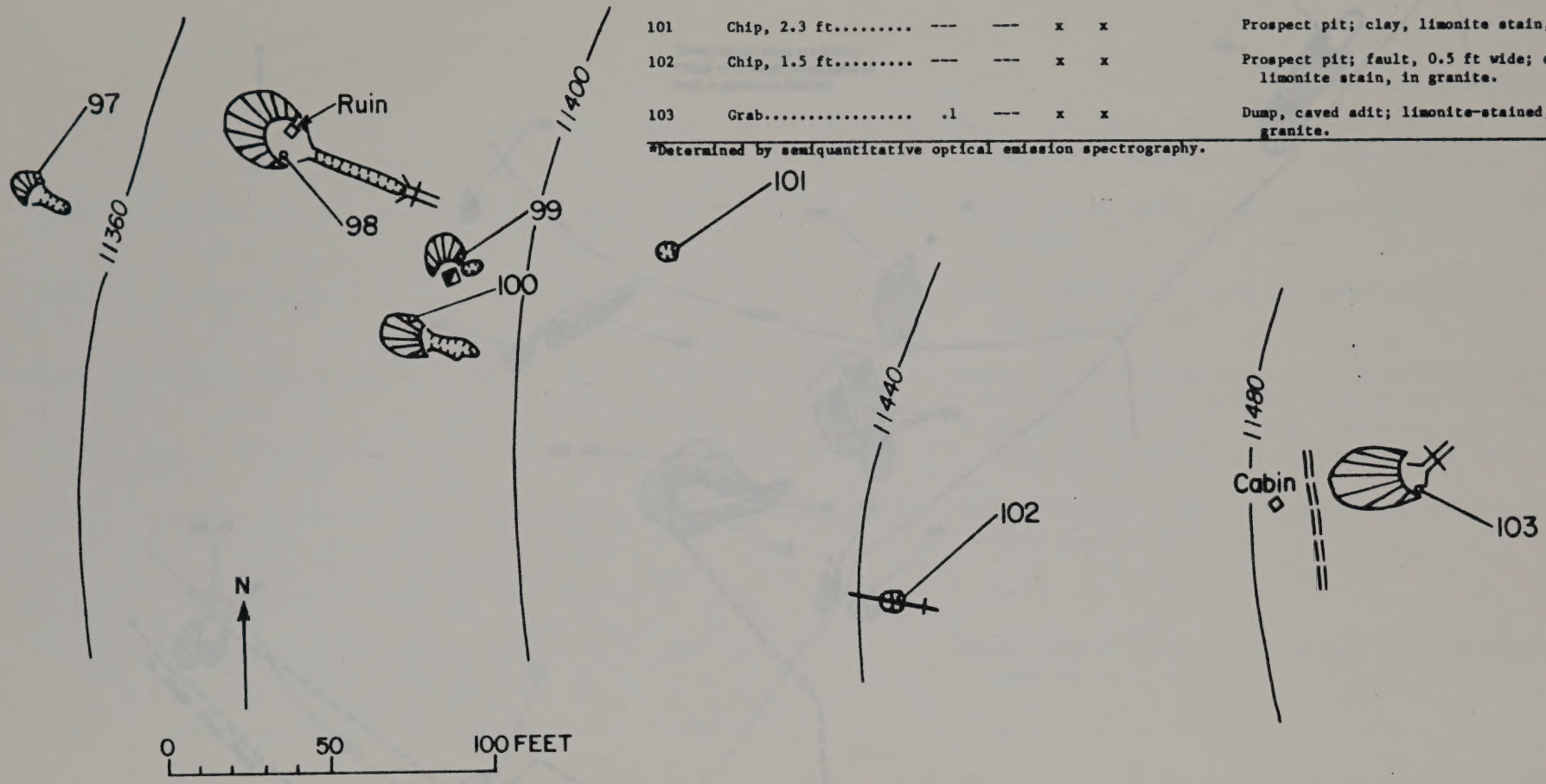


Figure 10.--Map of the Hans Hoffman Mine showing sample localities 97-103. Symbols used on the analytical data table are: ---, not detected; x, concentration less than 0.1 percent.

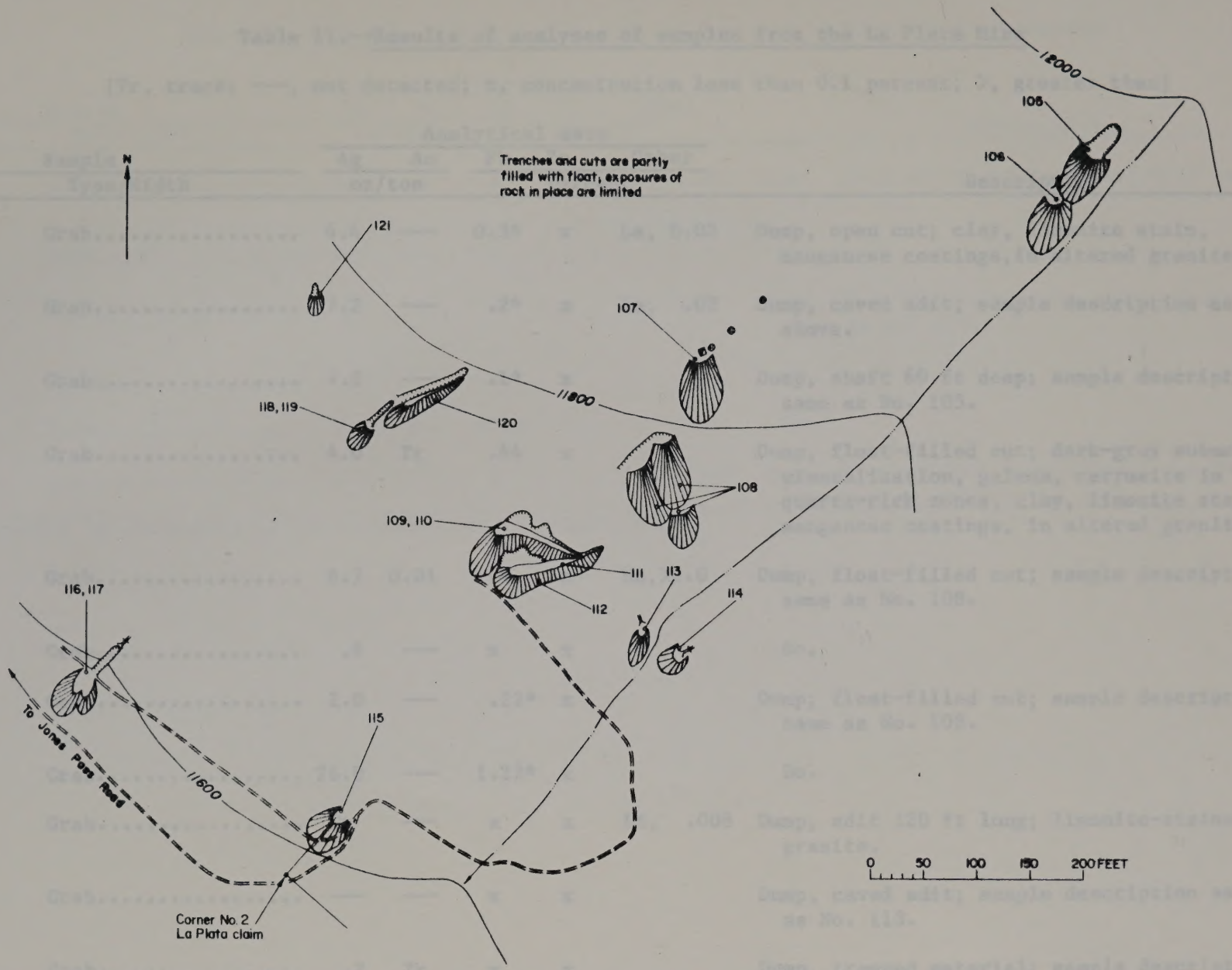


Figure 11.--Map of the La Plata Mine showing sample localities 105-121.

Table 11.--Results of analyses of samples from the La Plata Mine

[Tr, trace; ---, not detected; x, concentration less than 0.1 percent; >, greater than]

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
105	Grab.....	4.4	---	0.3*	x	La, 0.02	Dump, open cut; clay, limonite stain, manganese coatings,in altered granite.
106	Grab.....	7.2	---	.2*	x	La, .02	Dump, caved adit; sample description as above.
107	Grab.....	4.2	---	.1*	x		Dump, shaft 60 ft deep; sample description same as No. 105.
108	Grab.....	4.0	Tr	.44	x		Dump, float-filled cut; dark-gray submetallic mineralization, galena, cerrusite in vuggy, quartz-rich zones, clay, limonite stain, manganese coatings, in altered granite.
109	Grab.....	6.7	0.01	.4	x	Mn,>2.0	Dump, float-filled cut; sample description same as No. 108.
110	Grab.....	.4	---	x	x		Do.
111	Grab.....	2.0	---	.22*	x		Dump, float-filled cut; sample description same as No. 108.
112	Grab.....	26.0	---	1.22*	x		Do.
113	Grab.....	Tr	---	x	x	Li, .008	Dump, adit 120 ft long; limonite-stained granite.
114	Grab.....	---	---	x	x		Dump, caved adit; sample description same as No. 113.
115	Grab.....	.2	Tr	x	x		Dump, trammed material; sample description same as No. 113.

Table 11.--Results of analyses of samples from the La Plata Mine--Continued

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
116	Grab.....	0.1	---	x	x	Li, 0.009	Dump, caved adit; sample description same as No. 113.
117	Grab.....	---	---	x	x		Do.
118	Grab.....	.9	---	x	x	Mn,>2.0	Dump, float-filled trench; sample description same as No. 113.
119	Grab.....	.2	---	x	x		Do.
120	Grab.....	2.0	Tr	0.15*	x		Do.
121	Grab.....	.2	---	x	x	Mo, .002	Dump, float-filled prospect pit; sample description same as No. 113.

*Determined by semiquantitative optical emission spectrography.

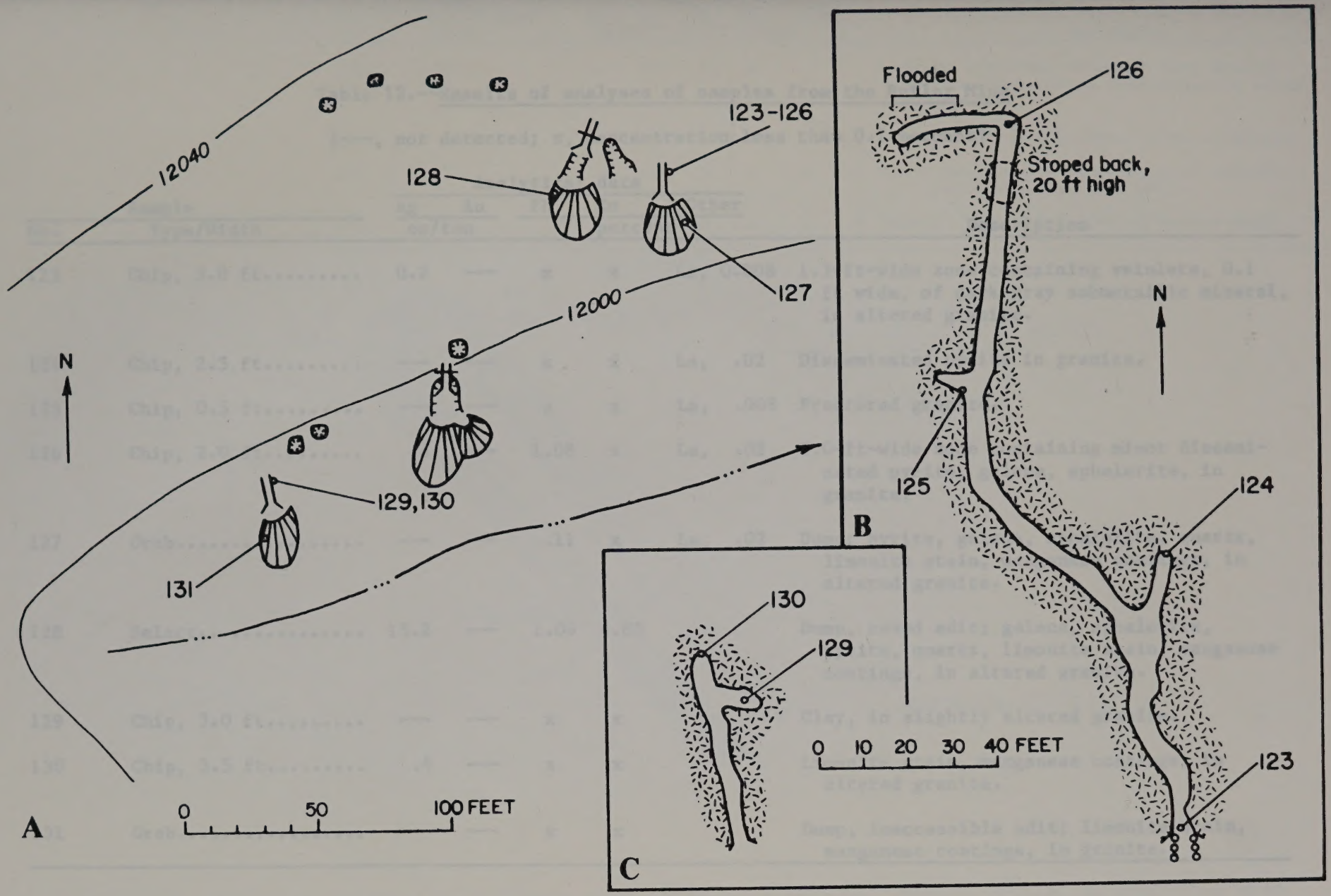


Figure 12A.--Map of the Butler Mine showing sample localities 123-131. B.--Lower adit. C.--Upper adit.

Table 12.--Results of analyses of samples from the Butler Mine

[---, not detected; x, concentration less than 0.1 percent]

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
123	Chip, 3.0 ft.....	0.2	---	x	x	La, 0.008	1.3-ft-wide zone containing veinlets, 0.1 ft wide, of dark-gray submetallic mineral, in altered granite.
124	Chip, 2.5 ft.....	---	---	x	x	La, .02	Disseminated pyrite in granite.
125	Chip, 0.5 ft.....	---	---	x	x	La, .008	Fractured granite.
126	Chip, 2.0 ft.....	.6	---	1.08	x	La, .02	2.0-ft-wide zone containing minor disseminated pyrite, galena, sphalerite, in granite.
127	Grab.....	---	---	.11	x	La, .02	Dump; pyrite, galena, sphalerite, quartz, limonite stain, manganese coatings, in altered granite.
128	Select.....	15.2	---	1.06	4.85		Dump, caved adit; galena, sphalerite, pyrite, quartz, limonite stain, manganese coatings, in altered granite.
129	Chip, 3.0 ft.....	---	---	x	x		Clay, in slightly altered granite.
130	Chip, 3.5 ft.....	.4	---	x	x		Limonite stain, manganese coatings, in altered granite.
131	Grab.....	---	---	x	x		Dump, inaccessible adit; limonite stain, manganese coatings, in granite.

Sample No.	Length of chip (feet)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
146	0.6	---	Tr	x	x		Irregular quartz-rich zone with gray, metallic mineralization; contact between granite, schist and gneiss.
147	1.8	---	---	x	x		Fracture, 0.05 ft wide; quartz pods, in granite.
148	1.2	---	---	x	x	As, 0.1	Quartz pod; limonite stain, manganese coatings, in granite at contact with schist.
149	2.5	0.1	---	x	x	Ba, .3 Mn, >1.0	Pegmatite vein, 3.0 ft wide, in altered schist.

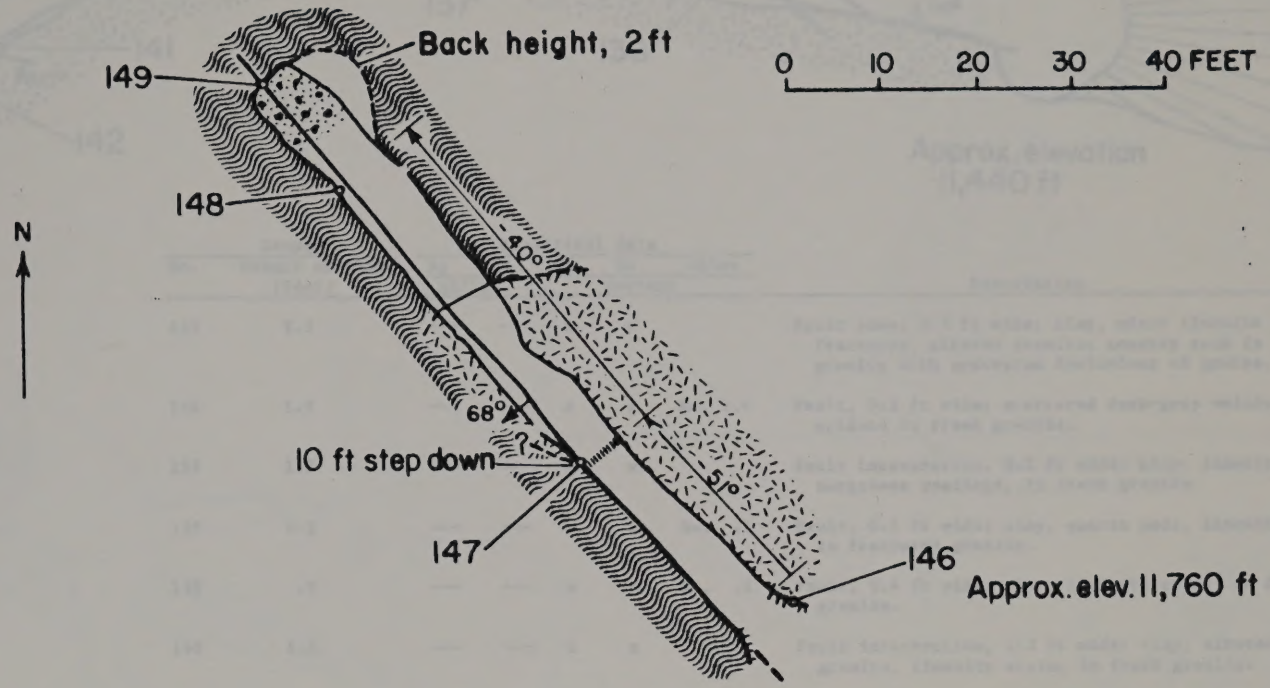
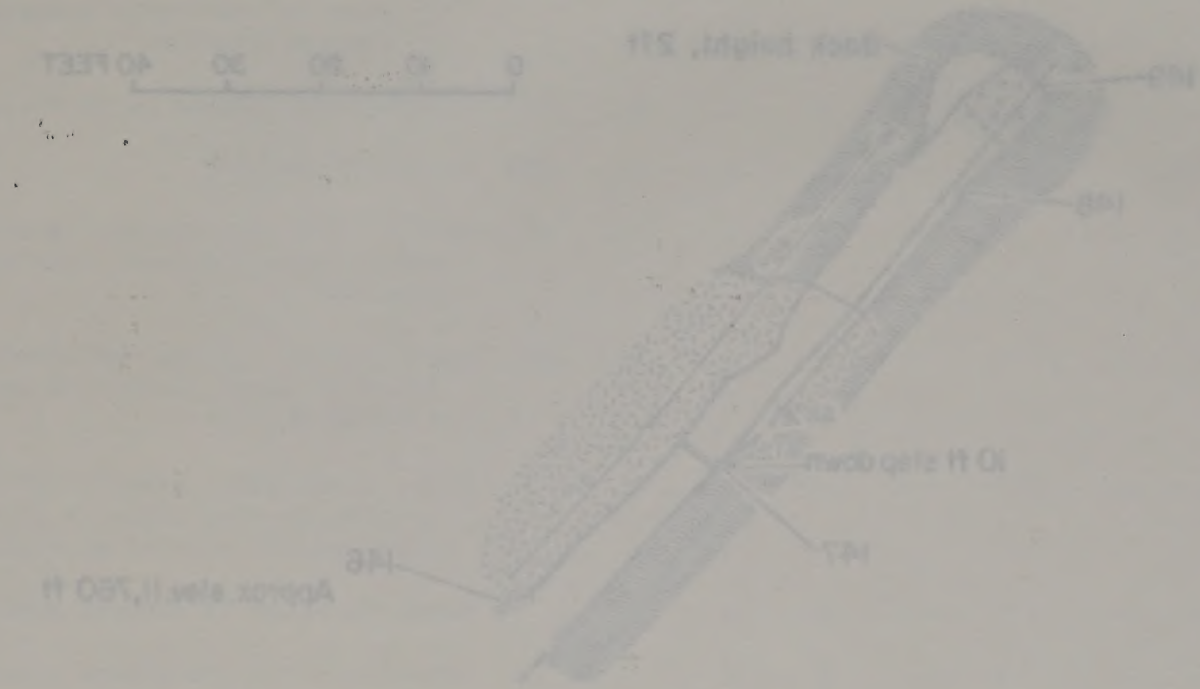
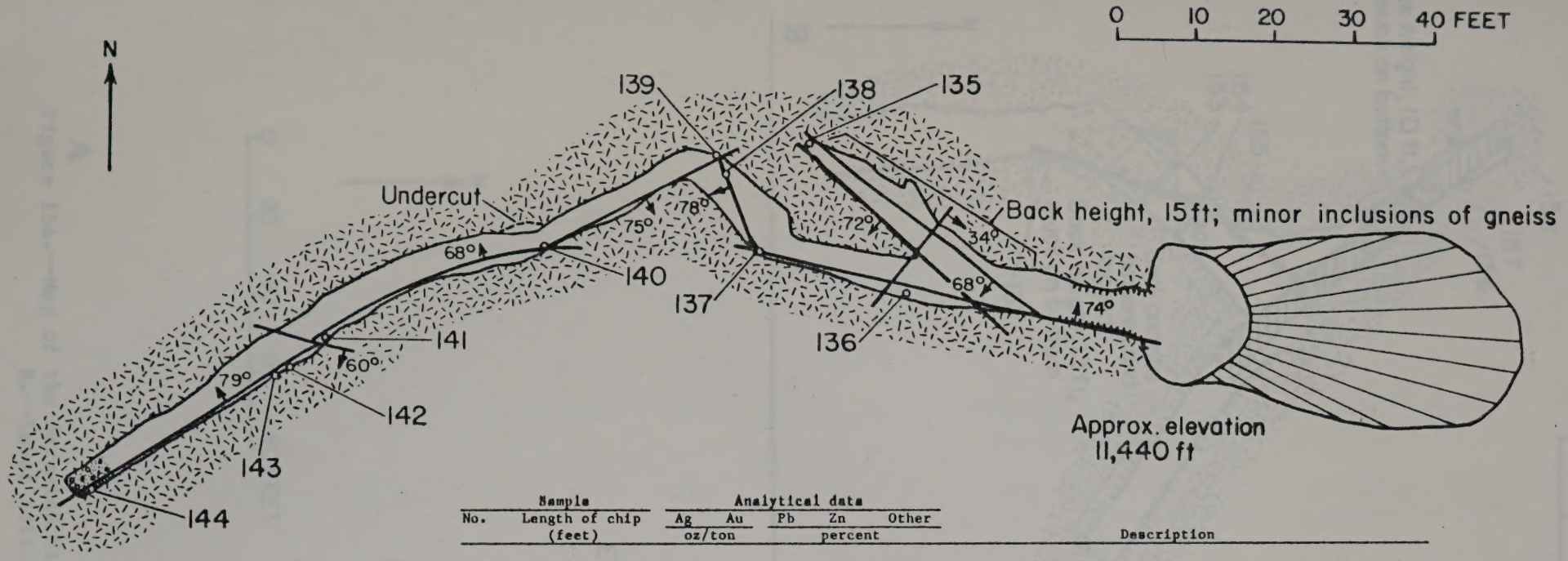


Figure 13.--Map of the No Name shaft showing sample localities 146-149. Symbols used on the analytical data table are: Tr, trace; ---, not detected; x, concentration less than 0.1 percent; >, greater than.





Sample No.	Sample Length of chip (feet)	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
135	2.3	---	---	x	x		Fault zone, 2.5 ft wide; clay, minor limonite stain; fractured, altered granite; country rock is fresh granite with scattered inclusions of gneiss.
136	1.5	---	---	x	x	Ba, 0.4	Fault, 0.3 ft wide; scattered dark-gray veinlets, epidote in fresh granite.
137	1.7	---	---	x	x		Fault intersection, 0.2 ft wide; clay, limonite stain, manganese coatings, in fresh granite.
138	1.3	---	---	x	x	Ba, .1	Fault, 0.1 ft wide; clay, quartz pods, limonite stain in fractured granite.
139	.5	---	---	x	x	Ba, .1	Fault, 0.4 ft wide; clay, limonite stain, in fresh granite.
140	1.3	---	---	x	x		Fault intersection, 1.3 ft wide; clay, altered granite, limonite stain, in fresh granite.
141	1.3	---	---	x	x		Fault intersection, 2.0 ft wide; sample description as above.
142	1.0	---	---	x	x		Clay, altered granite, dark-brown limonite stain, in fresh granite.
143	.8	---	---	x	x		Fault, 0.5 ft wide; clay, altered granite, limonite stain, in fresh granite.
144	.8	0.1	---	x	0.11	Mn,>8.0	Fault, 0.8 ft wide; sample description as above.

Figure 14.--Map of the No Name adit showing sample localities 135-144. Symbols used on the analytical data table are: ---, not detected; x, concentration less than 0.1 percent; >, greater than.

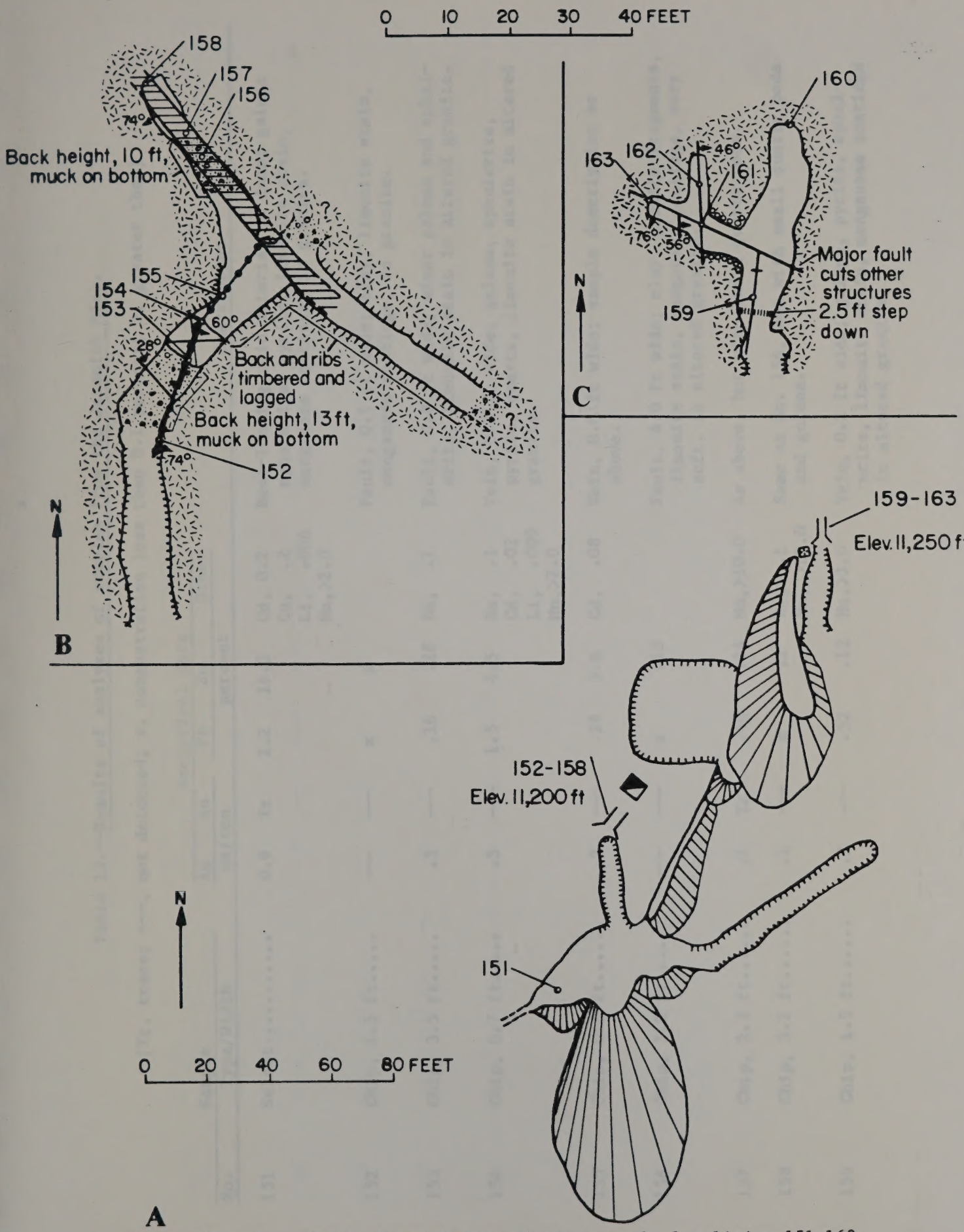


Figure 15A.--Map of the Jeremiah Mine showing sample localities 151-163. B.--Lower adit. C.--Upper adit.

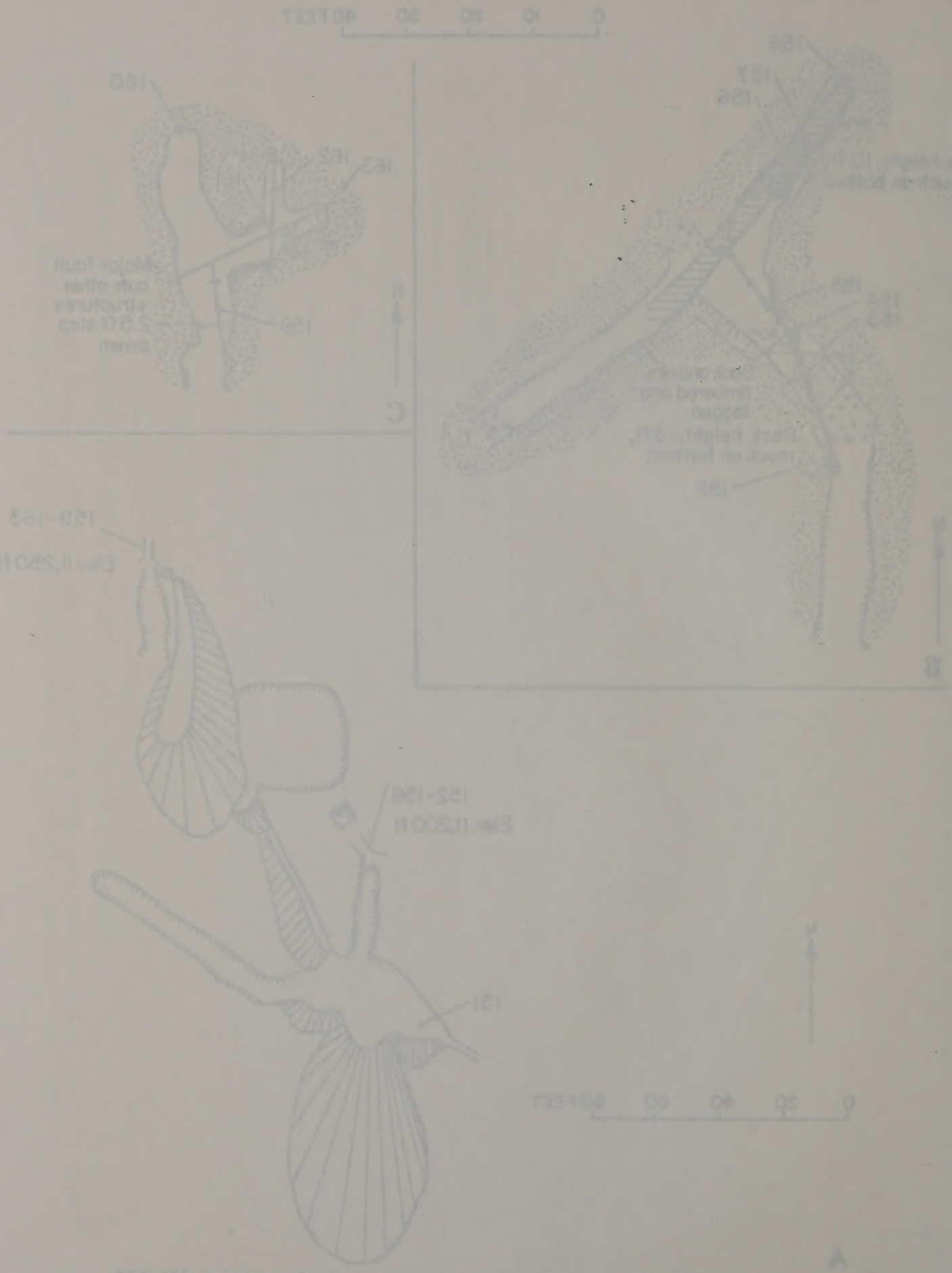


Table 13.--Results of analyses of samples from the Jeremiah Mine.

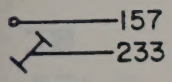
[Tr, trace; ---, not detected; x, concentration less than 0.1 percent; >, greater than]

Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
151	Select.....	0.9	Tr	1.2	16.5	Cd, 0.2 Cu, .2 Li, .006 Mn,>2.0	Best-looking vein material on dump; galena sphalerite, pyrite, limonite stain, manganese coatings, in granite.
152	Chip, 1.5 ft.....	---	---	x	x		Fault, 0.4 ft wide; clay, limonite stain, manganese coatings, in granite.
153	Chip, 3.5 ft.....	.5	---	.16	.28	Ba, .1	Fault, 0.8 ft wide; minor galena and sphalerite, limonite stain in altered granite.
154	Chip, 0.7 ft.....	.5	---	1.5	4.5	Ba, .1 Cd, .02 Li, .009 Mn,>2.0	Vein, 0.3 ft wide; galena, sphalerite, pyrite, quartz, limonite stain in altered granite.
155	Chip, 0.8 ft.....	.2	---	.26	3.6	Cd, .08	Vein, 0.8 ft wide; sample description as above.
156	Chip, 3.0 ft.....	---	---	x	.15		Fault, 4.0 ft wide; clay, granite fragments, limonite stain, manganese coatings, very soft, in altered granite.
157	Chip, 2.3 ft.....	.1	Tr	.40	.34	Mn,>10.0	As above, but with small quartz pods.
158	Chip, 3.2 ft.....	.1	---	x	.2	Ba, .1 Mn, >10.0	Same as No. 156, but with small quartz pods and galena.
159	Chip, 1.5 ft.....	.2	---	.52	.12	Mn,>3.0	Vein, 0.2 ft wide; galena, pyrite, sphalerite, limonite stain, manganese coatings in altered granite.

Table 13.--Results of analyses of samples from the Jeremiah Mine--Continued

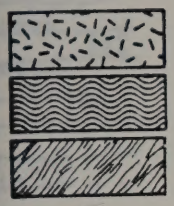
Sample No.	Sample Type/Width	Analytical data Ag (oz/ton)	Au (oz/ton)	Pb (percent)	Zn (percent)	Other (percent)	Description
160	Chip, 2.8 ft.....	---	---	x	x		Quartz pods, minor limonite stain, in altered granite.
161	Chip, 2.0 ft.....	0.2	---	0.54	0.64	Mn,>8.0	Fault, 2.0 ft wide; clay, limonite stain, in altered granite.
162	Chip, 1.0 ft.....	---	---	x	x		Fault, 0.2 ft wide; clay, limonite stain, in altered granite.
163	Chip, 2.3 ft.....	---	---	x	x	Mn,>9.0	Fault, 2.4 ft wide; clay, minor disseminated galena and pyrite, discontinuous quartz veinlets, 0.1 ft wide, limonite stain, in granite.

EXPLANATION OF SYMBOLS FOR FIGURES 2-15



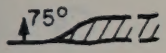
LOCALITY OF MINE MAP SAMPLE--Showing sample number

ROCK TYPES


Granite

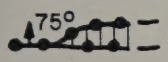
Gneiss

Schist

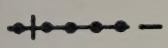


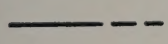
FAULT--Showing dip; dashed where inferred

VERTICAL FAULT--Dashed where inferred



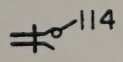
VEIN--Showing dip; dashed where inferred


VERTICAL VEIN--Dashed where inferred


CONTACT--Dashed where inferred

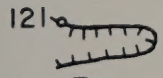
SURFACE OPENINGS--Showing sample locality number

Adit

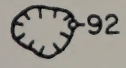


Caved or inaccessible adit

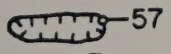
Shaft



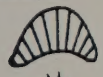
Open cut



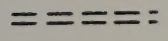
Pit

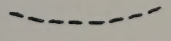


Trench

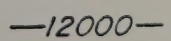

DUMP

STOCKPILE

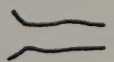

ROAD

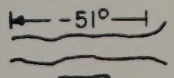

TRAIL

INTERMITTENT STREAM--Showing direction of flow



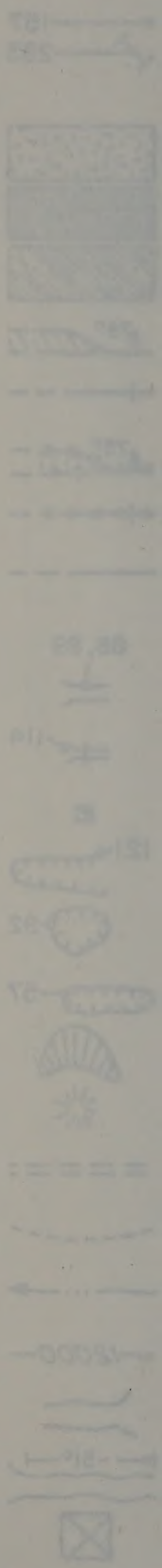
CONTOUR LINE--Showing elevation


PORTAL



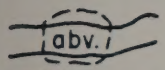
INCLINED WORKING--Showing slope

BOTTOM OF RAISE

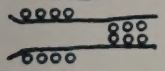


EXPLANATION OF SYMBOLS FOR FIGURES 2-15--Continued

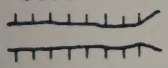
BOTTOM OF INCLINED RAISE



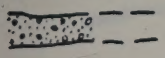
STOPING



TIMBERING



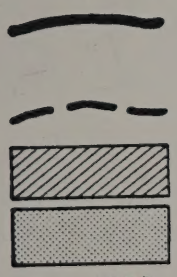
TIMBERING AND LAGGING



BACKFILLED OR CAVED WORKINGS--Dashed where inaccessible

PILLAR

EXPLANATION OF SYMBOLS FOR MINE AND PROSPECT MAP



APPROXIMATE BOUNDARIES OF THE VASQUEZ PEAK WILDERNESS STUDY AREA, AND THE WILLIAMS FORK AND ST. LOUIS PEAK ROADLESS AREAS

APPROXIMATE BOUNDARY OF THE FRASER EXPERIMENTAL FOREST

PATENTED MINING CLAIMS

UNPATENTED MINING CLAIMS

o302 LOCALITY OF SAMPLED OUTCROP--Showing sample locality number

SURFACE OPENINGS--Showing sample locality number

×2 Prospect pit

263 Shaft

18 Adit

176 Caved or inaccessible adit

ID: 88047935 TN23.M11 no. 83-67

1 map

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

OPEN FILE REPORT
MLA 67-83
PLATE 1

R. 77 W. 106°00'

R. 76 W.

R. 75 W. 105°45'

T. 1 S.

39°55'

FRASER

ST. LOUIS PEAK

ROADLESS

AREA

EXPERIMENTAL

FOREST

VASQUEZ

PEAK

WILDERNESS STUDY AREA

LA PLATA

DAILEY (ATLANTIC)

MINING

Henderson Mine

Little Alice

Puzzler

Scotia

Doctor

Scott

Fraser

Meryvale

Hideaway Park

Winter Park

Berthoud Pass

Colorado Mines Peak

Vasquez Peak

Mt. Flora

Mt. Eva

Mt. Bethel

Rocky Point

Bottle Peak

Green Ridge

Sugarloaf

Jones Pass

Vasquez Lake

Parika Lake

Arapaho Peak

Silver Creek

Fraser River

Ranch Creek

Williams Fork

Vasquez Creek

Kinney Creek

Parika Creek

Deadhorse Creek

St. Louis Creek

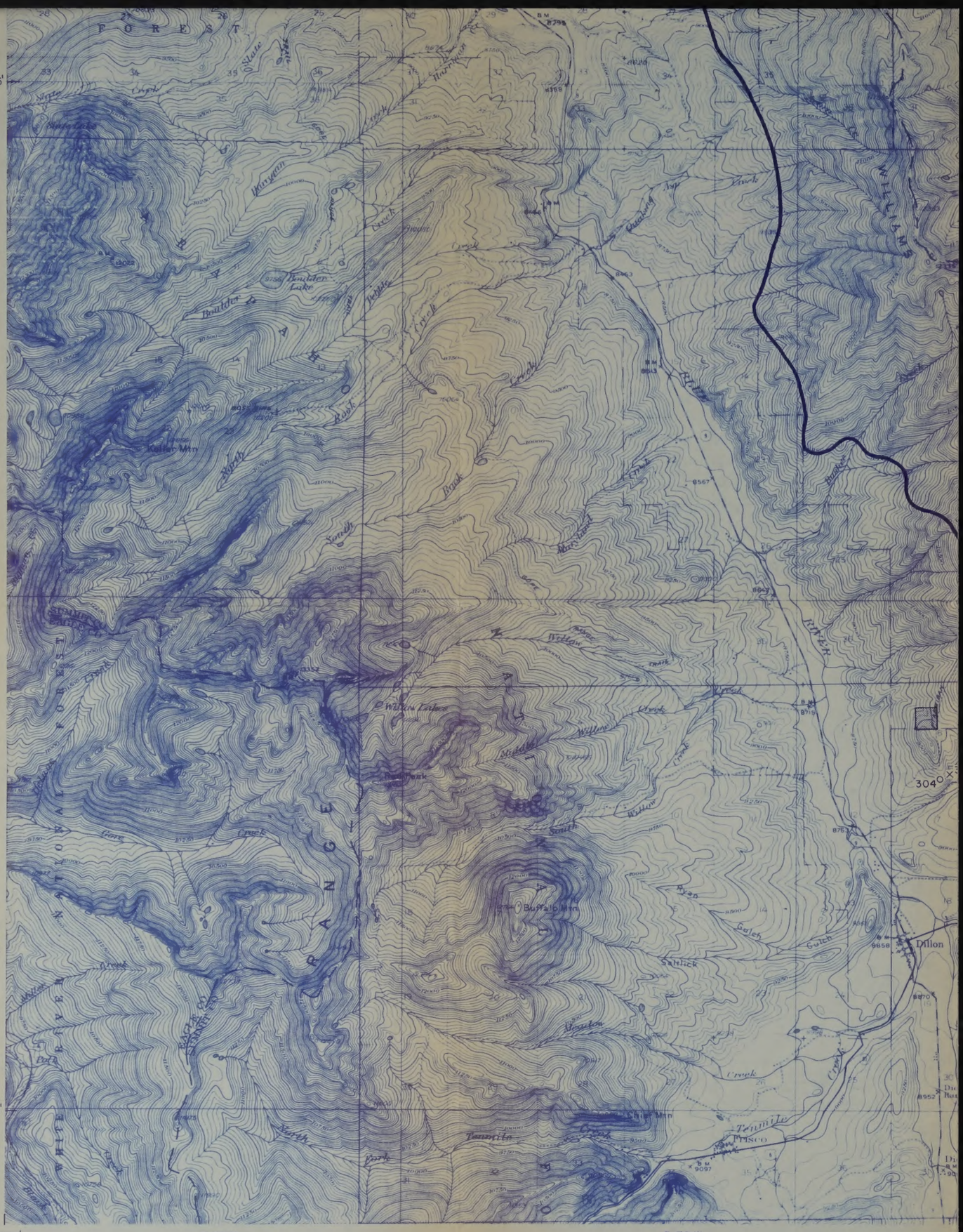
Barlow Creek

Ute Trail

Continental Divide

GRAND CO.

CLEAR CREEK CO.

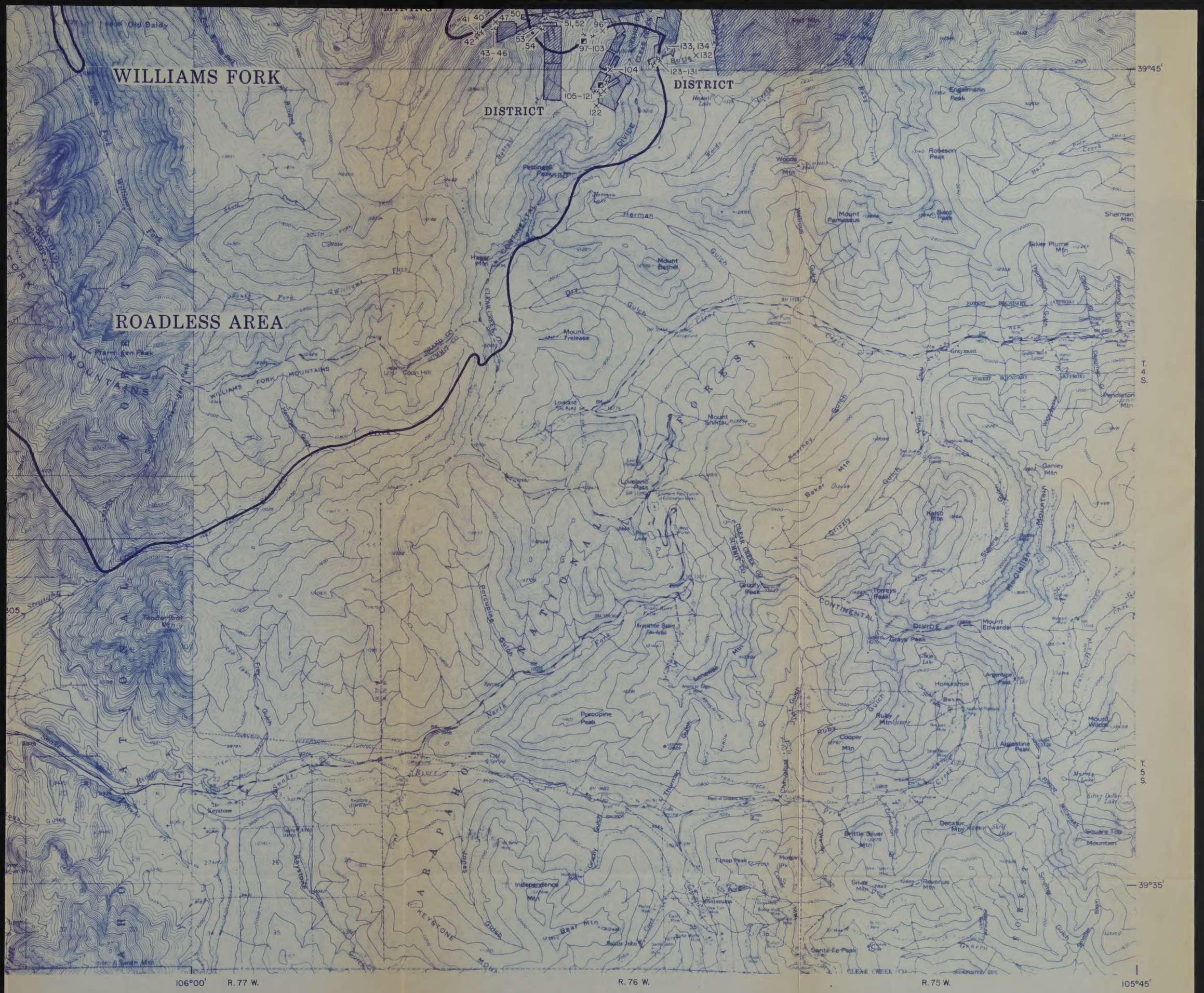


Base from U.S. Geological Survey
Dillon, 1920; Fraser, 1957;
Montezuma, 1958; Ute Peak, 1933.

MN

MINE AND PROSPECT MAP OF THE VASQUEZ PEAK W
CLEAR CRE

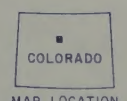
ALAN M. BIELSKI,



SCALE 1:50,000

½ 0 1 2 3 4 MILES

CONTOUR INTERVALS 50 AND 80 FEET



MAP LOCATION

Field work completed in 1982 by Alan M. Bielski, Terry J. Kreidler, and Louis W. Hamm; assisted by Diann D. Gese, Patricia Corbetta-Glasscock, and Russell A. Schreiner.

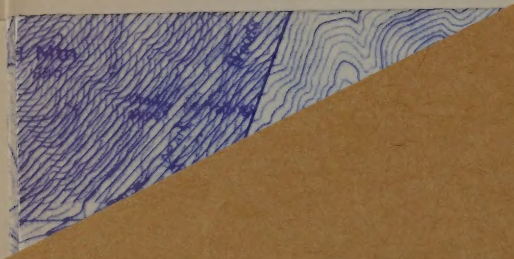
VILDERNESS STUDY AREA, AND ST. LOUIS PEAK AND WILLIAMS FORK ROADLESS AREAS, EK, GRAND, AND SUMMIT COUNTIES, COLORADO

BY

TERRY J. KREIDLER, AND LOUIS W. HAMM, U.S. BUREAU OF MINES

1983

OPEN



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Bielski, Alan M.
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Vasquez Peak Wilderness

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